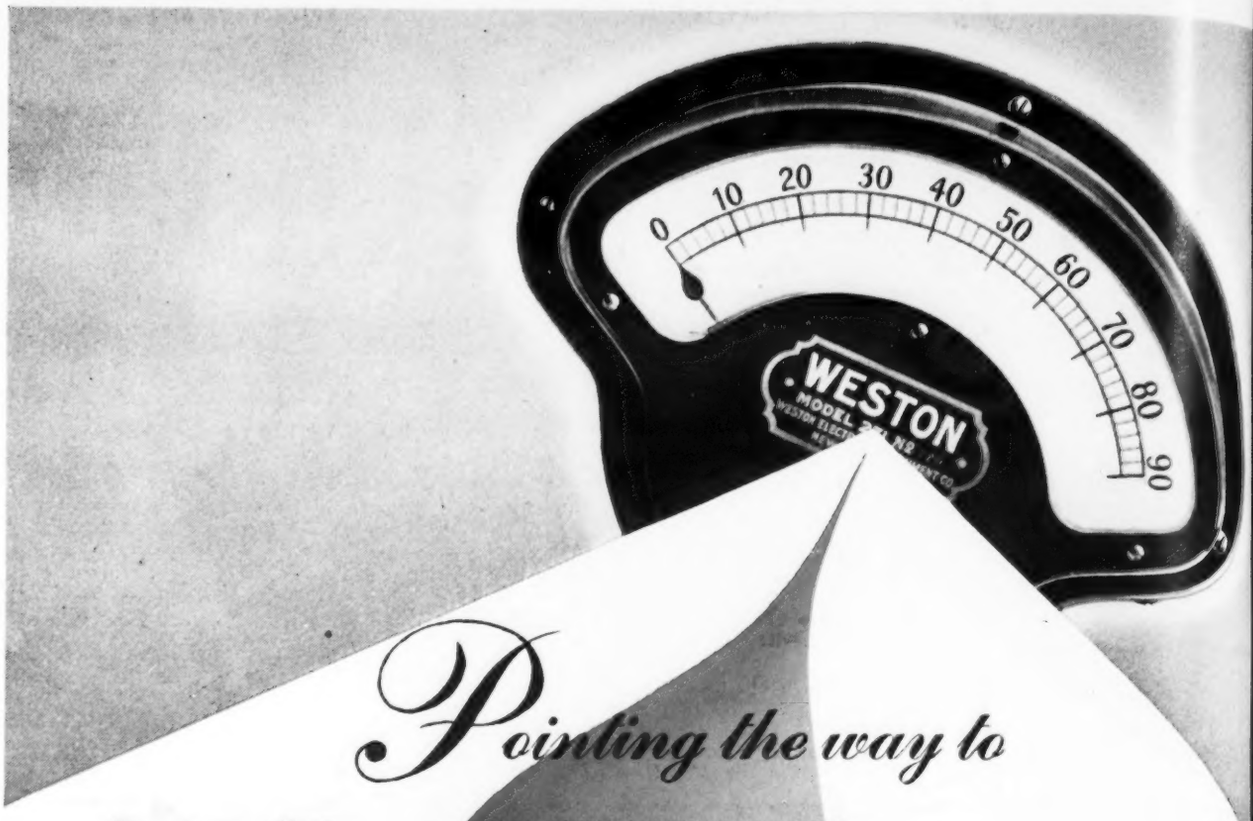
APR 23 1947
APR 8 1947

Electrical World

JUNE 23, 1945



Pointing the way to

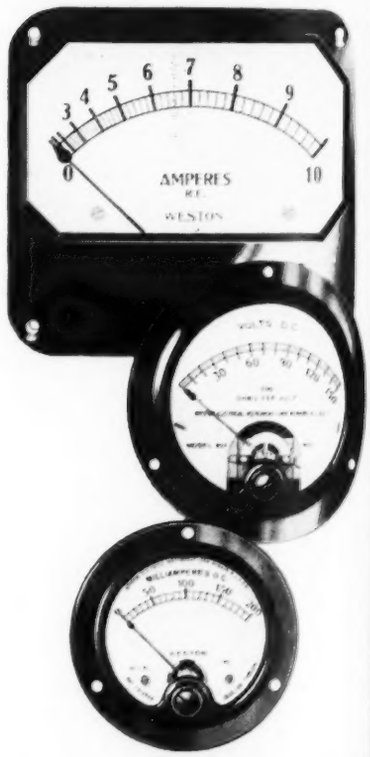
BUYER ACCEPTANCE *for tomorrow*

Many a brain-child of far-sighted companies now on the drawing-board, is destined for early birth. *Tomorrow, these products will be seeking market acceptance not only at home, but in all corners of the earth.*

With postwar markets highly competitive, manufacturers will strive to put into the product the best in materials components, and engineering skill. And if an indicating instrument is essential, it must be one not only of *proved* dependability, but one which has world-wide preference as well.

Logically, the instrument choice will be WESTON. For a WESTON on the panel gains instant recognition from equipment buyers throughout the world. To them, it is outward evidence of engineering soundness all throughout the device or machine. And to the manufacturer it brings an added sense of security . . . knowing that wherever they are used, his machines have a dependable and trouble free WESTON at the controls.

Before your equipment gets into the manufacturing stage, why not check your instrument needs with WESTON. Complete engineering service is freely offered. Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.



Weston

ALBANY • ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • JACKSONVILLE • KNOXVILLE • LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEWARK • NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH • ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE

In Canada, Northern Electric Co., Ltd., Powerlite Devices, Ltd.

APR 23 1947
APR 8 1947

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 71 YEARS

June 23, 1945 — Vol. 123, No. 25

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Please change my address on Electrical World

Name .....
Old Address .....
New Address .....
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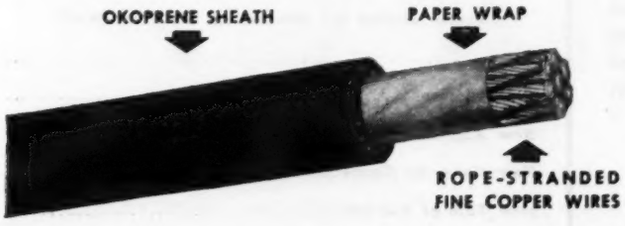
BUILT TO STAY ON THE JOB LONGER

...OKOCORD welding cables

For the many welding jobs in plant repair departments ... for steel fabrication and in construction work ... delivery of electrical power can be entrusted safely to Okocord Portable Cables.

Okocord cables for welding are designed to transmit uninterrupted power under severe conditions and external abuse. In the Okocord single conductor electrode-holder cable shown here, fine copper wires are rope-stranded for greater flexibility. They give longer life because they are first stranded together on the Uni-lay* principle and then "lubricated" by Okonite's special treatment. Their increased flexibilty results in better welding through easier, less tiring use of the electrode-holder. A paper wrap over the conductor leaves it clean for terminating, increasing flexibility still further. Additional mechanical strength is provided by seine twine cords embedded in an Okoprene sheath while the Okoprene protects against corrosion, resists oil, acids and alkalies.



There are many other types of Okocord portable cords and cable which cover a wide range of industrial applications. The Okonite Company, Passaic, N.J.

*Method developed under wartime secrecy for the U. S. Navy

OKOCORD ELECTRODE-HOLDER CABLE

Size A.W.G.	Number of Wires	Carrying Capacity Amperes	Volts drop 60° C. Copper Temp.
4	1078	100	3.18 per 100 ft.
3	1372	150	3.70 " " "
2	1715	200	3.92 " " "
1	2156	250	3.88 " " "
1/0	2695	300	3.72 " " "
2/0	3381	375	3.68 " " "
3/0	4263	450	3.51 " " "
4/0	5341	550	3.41 " " "

OKONITE

insulated wires and cables

4005

NOW COMES THE "EXTRA" DIVIDEND FOR USERS OF *Electroline* RECLAIMABLE AUTOMATIC LINE SPLICES

LITTLE DID WE KNOW, these 12 years while we were saying, "Electroline Automatic Line Splices are reclaimable" that the really big story had not yet been told.

Now this important reclaimable feature scores again. Vital materials from which Automatic Line Splices are made are mostly off to war . . . so it is impossible to supply the quantity of line splices we would like to but your stock bins will supply splices for immediate requirements.

Every "out of service" line equipped with Electroline Automatic Line Splices is a source of supply. These splices are reclaimable.

Electroline Splices can be removed in a jiffy. Back they go to stock bins for re-use . . . time and time again. Stock without stock expenditures. How's that for an "extra" dividend?

It is the everlasting quality of Electroline products that assures our users of adequate, effective usable Automatic Line Splices for the duration. The quality is there because long experience in this field has taught us how to put it there. Not only the first Automatic Line Splice, but also the first Reclaimable Line Splice came from the house of Electroline.

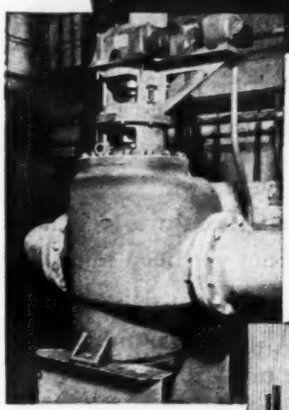
Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

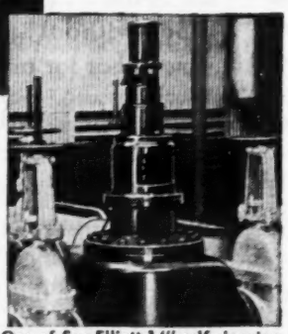
4121 SOUTH LA SALLE STREET • CHICAGO 9, ILLINOIS

Service water clears itself in

How the Elliott self-cleaning strainer is installed. Water goes straight through, foreign matter caught and ejected downwards.



One of three large self-cleaning strainers for bearing cooling water, in a central station.



One of five Elliott 14" self-cleaning strainers in a hydro plant. They protect fire pumps, transformer cooling and generator cooling coils.

ELLIOTT
SELF CLEANING STRAINERS

Without attention beyond occasional supervision, this unit will strain incoming water, remove and eject abrasive or other foreign matter, and deliver clear water for service use.

The straining process is continuous. A geared motor slowly rotates a sealing box which blocks off each straining section in turn. Back-flow of water then flushes the isolated straining section, driving the entrained impurities out through the bottom of the unit, and the cleared section again takes up its straining job.

The only bearing exposed to grit-laden water is the lower bearing of the rotating element. This is a cutless rubber bearing, immune to damage and easily replaceable should it become necessary. Elliott self-cleaning strainers serve many utilities especially where large quantities of relatively fine dirt must be removed.

Where manual cleaning is permissible, Elliott twin strainers will also give non-stop service, one cylinder always being in operation while the other is shut down for removal and dumping of the strainer basket.

Use our wide experience in meeting your straining needs. Talk it over with the Elliott man.

ELLIOTT COMPANY

Accessories Dept., **JEANNETTE, PA.**
Plants at JEANNETTE, PA. — RIDGWAY, PA.
SPRINGFIELD, O. — NEWARK, N. J.
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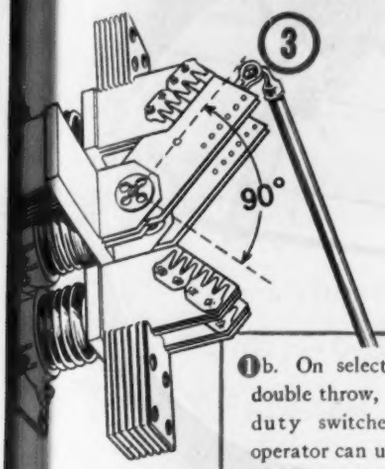
A-286A

STEAM TURBINES • GENERATORS • MOTORS • CONDENSERS • FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES • TUBE CLEANERS • STRAINERS • DESUPERHEATERS • FILTERS

CHECK the FACTS on
CUSTOM BUILT—HEAVY DUTY SWITCHES



❶b. On selector, or double throw, heavy duty switches the operator can unlatch and throw the blade with one easy motion.

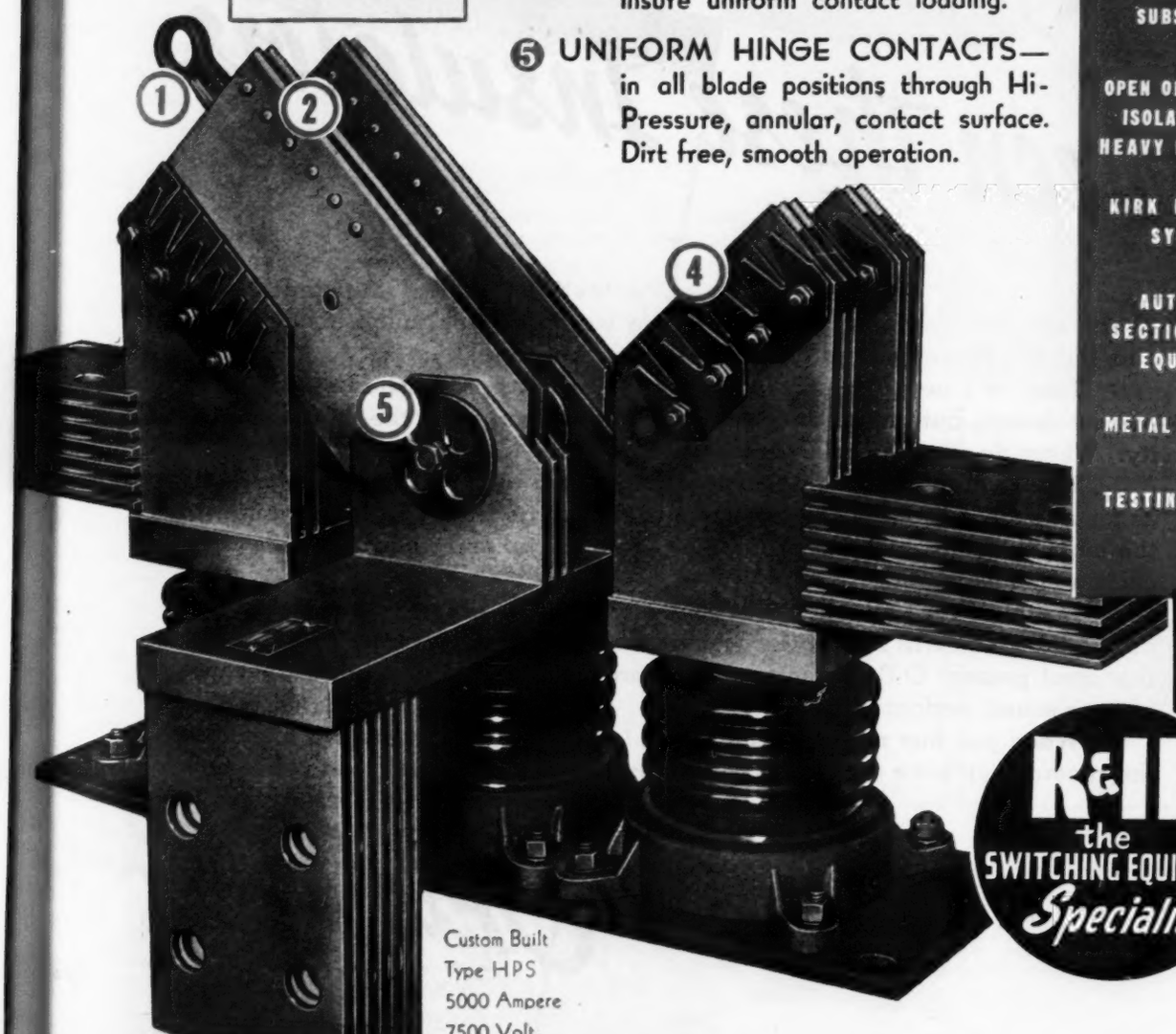
❶ EASY SWITCH OPERATION, made through—
- a. High leverage pry-out blade release
- b. Shuffle blade action — halves of blade release in succession.
- c. Limited area contacts.

❷ HI-PRESSURE SPOT CONTACTS—self cleaning with each blade operation.

❸ POSITIVE LATCHING and UN-LATCHING controlled by integral handle and lock.

❹ INDIVIDUAL PRESSURE SPRINGS insure uniform contact loading.

❺ UNIFORM HINGE CONTACTS—in all blade positions through Hi-Pressure, annular, contact surface. Dirt free, smooth operation.



Custom Built
Type HPS
5000 Ampere
7500 Volt

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SECTIONALIZING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

R&IE the SWITCHING EQUIPMENT *Specialist*

RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.
BRANCH IN CANADA — EASTERN POWER DEVICES, LIMITED, TORONTO

There's a vast difference between these Insulators

IT'S SOMETHING of a paradox with switch and bus insulators that a *new* one won't tell you much about an *old* one, but an *old* one will tell you a lot about a *new* one!

Tests on a new insulator indicate adherence to established standards of correct design, but they cannot predict the thing you want the most--reliability. Where do you find this? In the records of old installations.

When you buy station insulation today, you are protected by standards as far as such standards can possibly go, but to get that one thing you want the most, you must look back--far back--into the inherent "family traits" of a certain manufacturer.

Do this with O-B. You will find 30-year-old O-B station insulators still on the job. You will find entire systems with nothing but O-B. You will find that most present O-B station insulators are bought on repeat orders, because of their sound performance.

When you buy new switch and bus insulators, look at the old ones. See the record *they* have established. This sensible approach will lead you to O-B.

Ohio Brass

MANSFIELD, OHIO

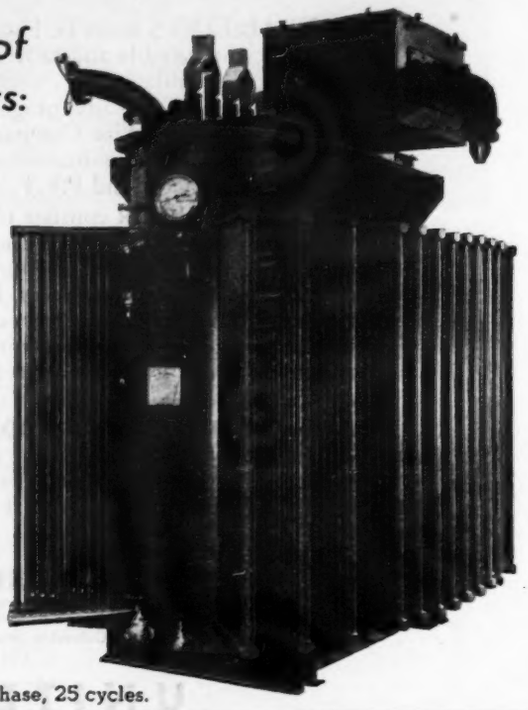
CANADIAN OHIO BRASS COMPANY, LIMITED,
NIAGARA FALLS, ONTARIO

For convenience and economy of transformer installations indoors near the load centers

Ask for Askarel

Pennsylvania's noninflammable, non-explosive, liquid-filled transformer

Check these outstanding qualities of Pennsylvania Askarel Transformers:



3000 kva, ASKAREL, 3 phase, 25 cycles.

Circular Coils Possess Maximum Inherent Strength

In regular oil-cooled transformers, varnish is used to increase the mechanical and electrical strength of the transformer coils, irrespective of the shape of the coils. This kind of varnish, however, cannot be used to treat coils in a transformer where noninflammable liquids are employed. Therefore, without the aid of this varnish, it is imperative that the coils in a noninflammable transformer have great inherent strength. Pennsylvania circular coils possess the maximum inherent mechanical and electrical strength!

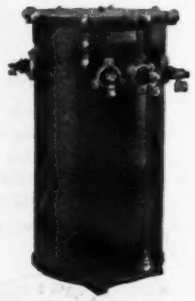
Radiators Built to Withstand High Pressures

Askarel transformers develop high pressures inside the tank because of the sealed, pressure-tight, tank construction necessary to prevent loss of Askarel through evaporation. Sturdy Uni-Row radiators on Pennsylvania Askarel transformers are designed to meet these high pressures. As rugged as the tanks themselves, these radiators are permanently welded in position and tested at 100 lbs. pressure. Radiators are spaced around the tanks so that each tube of each radiator is easily sandblasted, cleaned and painted.

Self-Reclosing Safety Valve Relieves Excessive Pressures

Safety valves are mounted on the covers of all Askarel transformers above 25 kva, and operate in case abnormal pressures exceeding 12 pounds per square inch develop inside the tanks. These safety valves are self-reclosing to prevent foreign matter from entering the transformers.

333 kva, ASKAREL, 1 phase, 60 cycles.



25 kva, ASKAREL, 1 phase, 60 cycles.

Pennsylvania TRANSFORMER COMPANY
PITTSBURGH, PENNSYLVANIA

Pennsylvania TRANSFORMERS

- Since Askarel Transformers are noninflammable and nonexplosive, they may be installed indoors at the load centers without a vault or fire door.
- Since Askarel is nonsludging and nonoxidizing, and the transformer tanks are pressure-tight and moisture-proof, Askarel transformers may be installed outdoors as well as indoors.

This combination gives yo

U·S·S AMERDUCTOR *plus* P.F.T. Armor Rods

RURAL LINES must be low in first cost, efficient, reliable and as free from maintenance as possible.

To obtain all these advantages in one line, American Steel & Wire Company engineers have developed a combination consisting of U·S·S Amerductor and P.F.T. Armor Rods.

U·S·S AMERDUCTOR consists of two copper wires for high conductivity and one galvanized steel wire for extra strength. This permits longer spans, fewer poles, fewer insulators and greater strength to resist sleet and wind storms. The galvanized wire resists corrosion and has stood up extremely well in severe service.

P.F.T. PREFORMED ARMOR RODS protect the conductors at the support points where most trouble occurs. The armor rods are easy to install on hot or cold lines. Inexperienced crews can quickly learn to install them with the usual tools.

Multiple Wire Ties. Almost any conventional methods of clamping or tieing may be combined with this system. However, extended testing of some special "multiple wire" ties indicates that these are extremely effective, inexpensive and easy to install. Details and instructions are included in our booklet, "P.F.T. Armor Rods and Multiple Wire Ties." Write for a copy.

This combination of conductor, armor rod and tie has been worked out after years of research into the causes of failure on rural lines. We urge you to install a few Amerductor lines and keep careful records of the service. You will convince yourself that many of the baffling problems of rural line operation have been effectively overcome.

American Steel & Wire Company

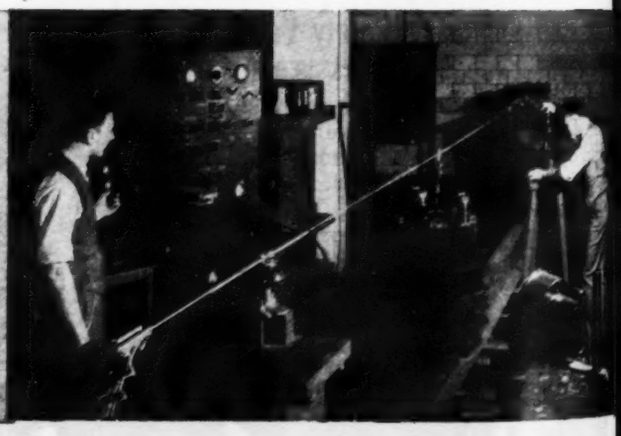
Cleveland, Chicago & New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

UNITED STATES STEEL

Vibration — corrosion — conductor burns — which causes the most line failures?

Engineers differ on this point but the results of exhaustive research in our testing laboratories and in the field, point to *vibration* as the major source of trouble in most parts of the country. P.F.T. Armor Rods are designed to reduce vibration to a minimum. What's more they protect the conductor against corrosion and burns at the supports. Thus conductor life is greatly increased.

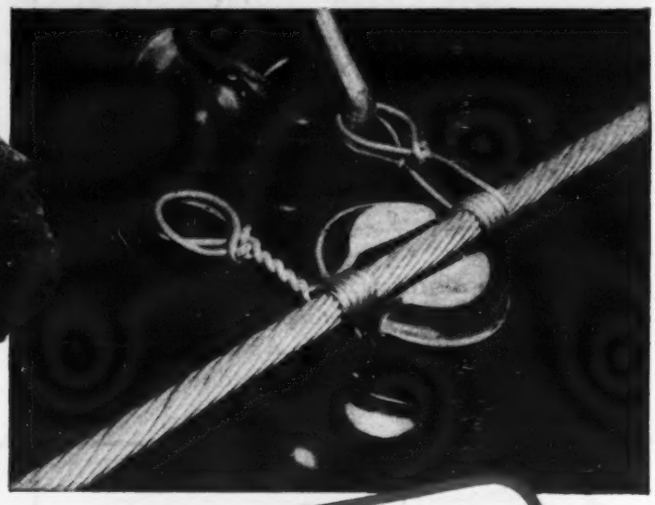


Other U·S·S American Electric Wire and Cable Products

- New PS Conducting Rubber Shielded Wire and Cable.
- Ampyrol — Synthetic-insulated Wire and Cable for switchboards and machine tools.
- Amerclad — Tough abrasion resisting co for portable tools, motor leads, pow cable.
- Amerbestos — Asbestos-insulated Wi and cable.

yo w-cost, trouble-free rural lines

Multiple Wire Tie made on P.F.T. Armor Rod with "hot line" tools. Armor Rod protects conductor, preventing any damage during installation.



How Armor Rods guard the danger points

Support points are the danger spots on rural lines. So if you control vibration, corrosion and wear at the supports, you eliminate many of the causes of trouble. This is why P.F.T. Armor Rods are so effective:

• REDUCED VIBRATION EFFECT AND BETTER DAMPING protect line from chafing and fatigue. Assure continuing strength to resist sleet and wind storms.

• LESS CORROSION AT SUPPORTS. Armor Rods greatly reduce corrosion of conductors at supports and practically eliminate the action of weathering and electrolysis.

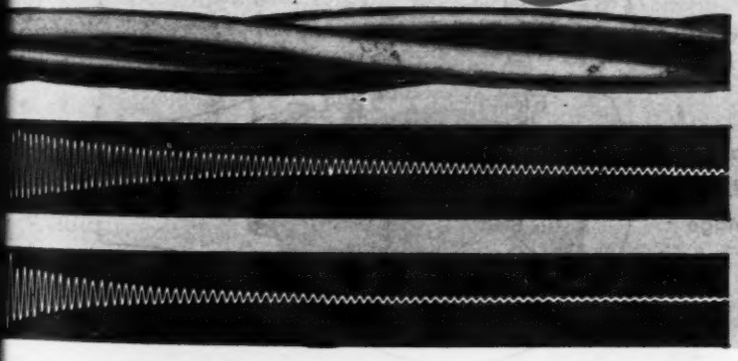
• REDUCED ABRASION AND CHAFING AT SUPPORTS. There is practically no relative motion between conductor and the ends of the reinforcements. The more vulnerable conductor wires are kept out of contact with clamps or ties.

• DAMAGE TO CONDUCTOR FROM ARC-OVER ELIMINATED. Since Armor Rods completely cover conductor, arc-over occurs between Armor Rod and ground and conductor is protected.

• PITTING of conductor strands presumably due to flashover to suspension clamps, is avoided because of close contact between conductor, Armor Rod and clamps. Strand so damaged in clamps may be reinforced for continued service. "By passing" clamps with rods will reduce losses in clamps and prevent such conductor burns.

• HOLDING POWER of ties and clamps is unbelievably high with P.F.T. Armor Rods.

• SIMPLE INSTALLATION. Inexperienced men can learn to install P.F.T. Armor Rods in short time without special tools. Armor Rods can be applied to either "hot" or "cold" lines.



U·S·S Amerductor. Two galvanized copper wires for high conductivity, one galvanized steel wire for *extra* strength. Permits longer spans, has long service life, reduces maintenance, keeps costs down.

Damping and decay curves on No. 4 A.C.S.R.

1. No tie—no armor. Slow damping.

2. P.F.T. Armor Rod and three-piece tie. Quick damping.

·S·S Amerductor Steel-Copper Conductors

The Food Must Be Hot . . . The Customers Cool

1 The food in A's restaurant couldn't be finer—
And steaming hot—*but then so is the diner!*
Which proves why folks shun A's delectable fare
To seek out a place that has breathable air.

2 Competitor B, who is nobody's fool,
Keeps food good and hot—*but his customers cool.*
With air that increases the pleasures of eating
He's had to expand his arrangements for seating.

3 For dining that satisfies, one thing's agreed upon—
Comfort's as vital as what people feed upon.
So, if you're lagging behind competition
Remember the answer—*correct* air conditioning.

Air Conditioning will be a postwar essential to almost every conceivable business. Executives everywhere—your commercial and industrial consumers—are hearing about *correct* air conditioning through advertisements like this.

They're learning to depend upon Westinghouse for correct air conditioning . . . the scientifically-engineered blending of correct temperature, humidity, circulation, ventilation and air cleanliness.

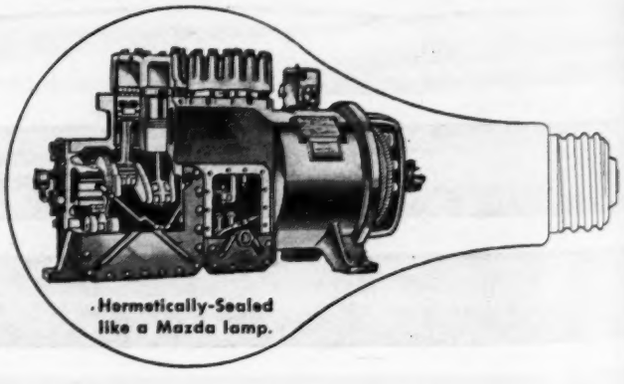
Your commercial men will find the Westinghouse booklet "How to Plan Correct Air Conditioning," a valuable aid in showing consumers how to get what they need for their complete satisfaction. We'll be glad to supply it in quantity. Phone your nearest Westinghouse office or write Westinghouse, 150 Pacific Avenue, Jersey City 4, N. J.

THE SERVICE-PROVED HERMETICALLY-SEALED COMPRESSOR

These Westinghouse economy-satisfaction advantages have been proved by years of service in thousands of installations:—

No Shaft Seals. During wartime refrigerant shortages, few Westinghouse systems were ever "down." Why? Because seal leaks are the cause of a large percentage of all system failures.

Few Parts to Wear . . . Direct-Drive Efficiency . . . Space-Saving Refrigerant-Cooled Motor.



Hermetically-Sealed like a Mazda lamp.

Westinghouse CORRECT Air Conditioning

PLANTS IN 25 CITIES . . OFFICES EVERYWHERE

Westinghouse Presents *John Charles Thomas* • Sunday, 2:30 E.W.T., N.B.C.

Sixty million jobs

...and more electricity

AFTER the war, industry will put millions of people to work making things to add convenience and happiness to our everyday lives. Many of these will be electrical appliances. In every home, more electricity will be measured by Modern Meters for the Modern Load.

In postwar planning, take into account the potential loss of profits traceable to obsolete meters. Plan to use Duncan Meters for extensive replacements as well as for installations in new homes.

Duncan Meters give correct readings for wide load ranges and offer: Straight Line Accuracy up to 400% Rated Load; Alnico Damping Magnet; Porcelain Terminal Blocks; Lifetime Bearings; Micro-set Adjustments and Layer-on-Layer Construction.

DUNCAN ELECTRIC MFG. CO.

LAFAYETTE INDIANA

ARMY E NAVY

makers of pre[illegible] for forty years

DUNCAN

WATTHOUR METERS

Pre-Test Your

Scale of Models: ½" = 1'

With these accurate scale models of Allis-Chalmers Prefabricated Unit Substation apparatus, you can quickly see what's available, how it can fit together, how power distribution arrangements will look in your own plant!

IT'S SO SIMPLE, so practical, so fast—*visual planning* of substations with Allis-Chalmers' new "Unit Sub Builder" Set!

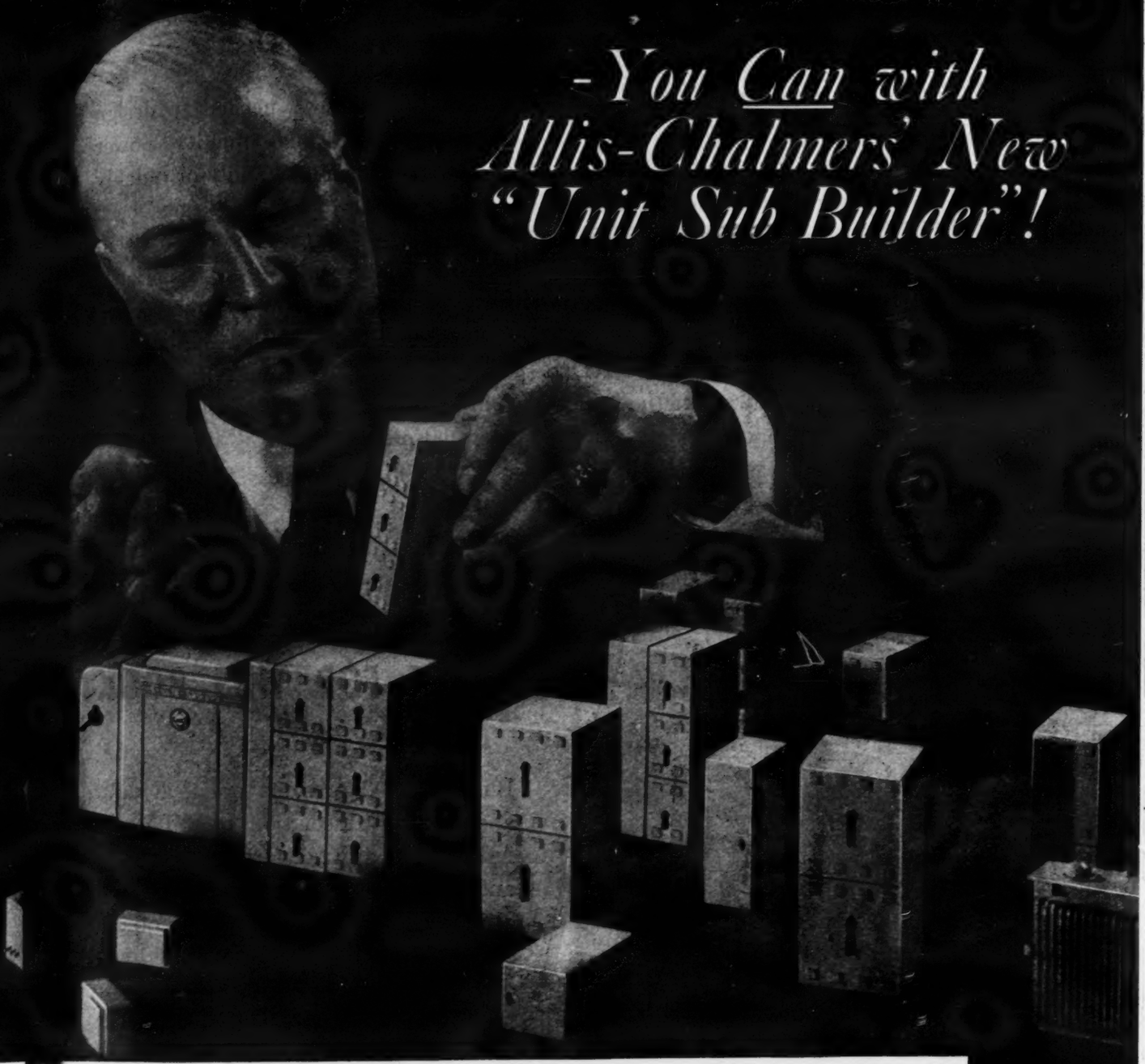
And it's good insurance — you *pre-test* your ideas — *see* just what you're getting in terms of dimensions, characteristics, appearance.

Here are the elements Allis-Chalmers Prefabricated Unit Substations are made of — in accurate scale models — plus a new "Unit Sub Slide Rule" to simplify breaker calculation, a new "Unit Sub Check List" to give you the added planning safety of a *double* check.

Right on the top of your desk you can build up all possible solutions to your power distribution problems — compare them from every point of view. For the ultimate in visualization, you can have a floor plan of your factory drawn to the same scale as the models — ½ inch to 1 foot.

r Unit Sub Ideas

-You Can with Allis-Chalmers' New "Unit Sub Builder"!



and build up your unit sub *right where it will stand!*

This new service is yours with *no obligation.* Call your nearby Allis-Chalmers district office for a demonstration of the new "Unit Sub Builder", by an Allis-Chalmers field engineer. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WISCONSIN.

• • • A 1747

Work Out Your Ideas with
ALLIS-CHALMERS
"Unit Sub Builder" Set!

Standard TRADE MARK

You rightly insist on **dependability** and **economy** in power transformers — and for that reason you will be interested in the booklet described below. You will also be interested in the pictures of STANDARD'S quality manufacturing methods illustrated on the opposite page.

The "know-how" needed to design and produce high quality power transformers is not easily or quickly acquired. In our case, it has been developed through more than twenty-five years of specific experience with a wide variety of transformer problems.

Make use of this ability when you are planning your transformer installations.

WRITE FOR THIS BOOK

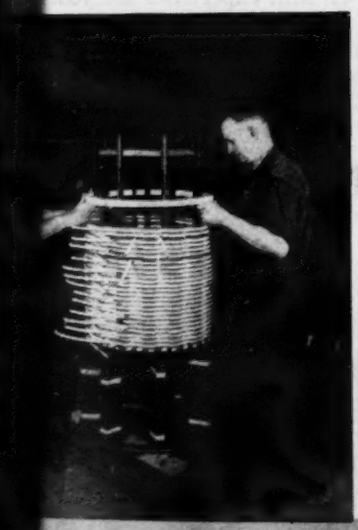
Bulletin S-402 presents practical data and useful information on STANDARD Power Transformers. Ratings and dimensions of typical units are given, as well as a description of the construction features that assure long, dependable, efficient service.

THE STANDARD TRANSFORMER COMPANY

WARREN OFFICES IN PRINCIPAL CITIES

RANSFORMERS

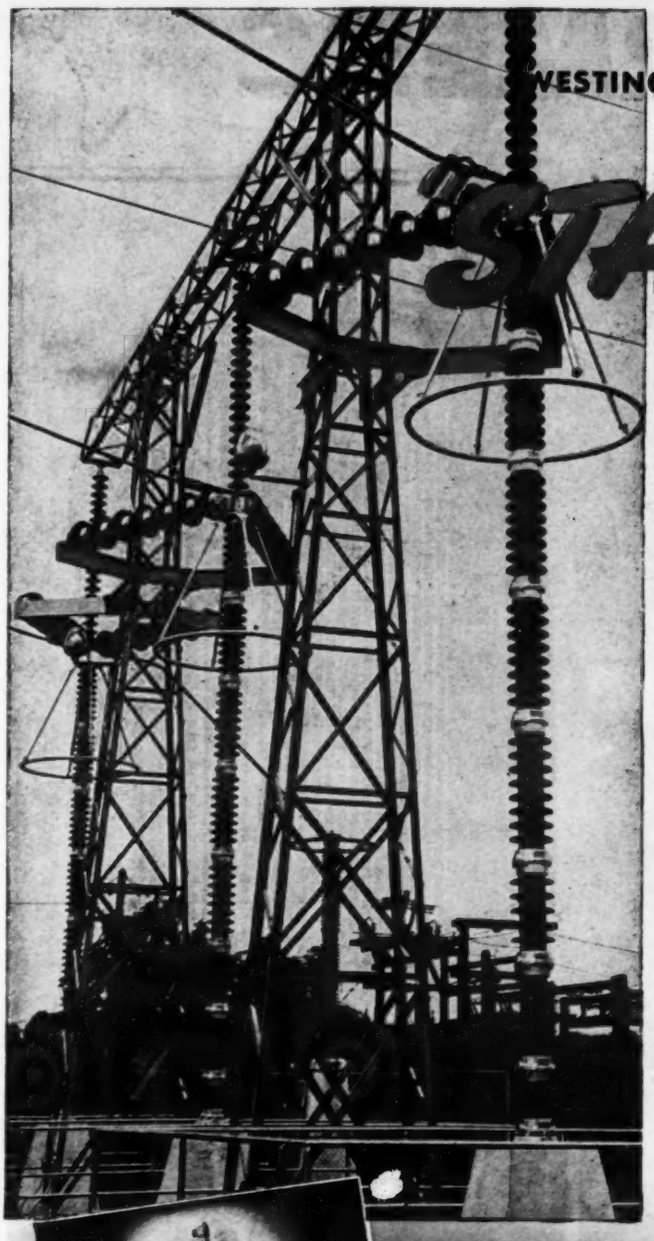
An example of STANDARD Power Transformer design, in which the location of radiators and terminals has been made to conform to specific installation requirements.



Skilled hand work assures highest quality of finished job. High voltage coils are carefully stacked to assure accurate positioning.

Only the best materials are used for insulation of STANDARD Transformers, thus assuring maximum service and minimum trouble.

Stacking the core laminations. Carefully selected low-loss, silicon alloy steel sheets, varnished on both sides are used.



WESTINGHOUSE LIGHTNING PROTECTION

"STACKS UP"

TO ANY SUBSTATION REQUIREMENTS

. . . with Type SV Autovalve Arresters up to 287 kv

Four basic units—the 20, 25, 30 and 37 kv sizes—can be "stacked" to meet the individual voltage requirements of most substations. This flexibility often reduces height of "stack" . . . permits reduced and simplified stocking of spares. Smaller units, rated from 3 to 15 kv, are available for applications where still greater flexibility is needed.

The Type SV Autovalve Arrester combines low impulse spark-over with low voltage during discharge of lightning current, for maximum protection to expensive apparatus. The arrester will handle short-time surges of 100,000 amperes and long-time, low-current, "hot" lightning equally well.

The Westinghouse complete line of arresters ranges from these Type SV Arresters (which today are protecting some of the largest electrical generating plants in the world) down to thumb-size signal arresters safeguarding vital railway operations. It is the result of decades of continuous and exhaustive research in lightning protection.

Westinghouse has pioneered many new advances in the art of lightning protection—and today maintains one of the world's largest lightning research laboratories, in addition to its extensive field research. The results of this research and experience are yours in Westinghouse arresters.

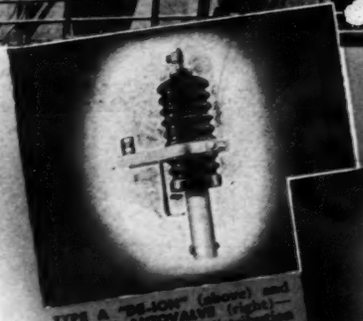
For help on any lightning protection problem, call your Westinghouse office, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-69575

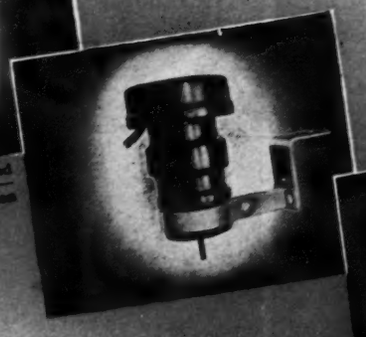
Westinghouse

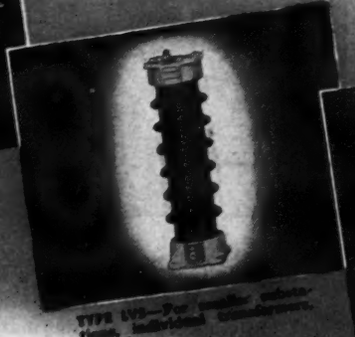
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

LIGHTNING ARRESTERS

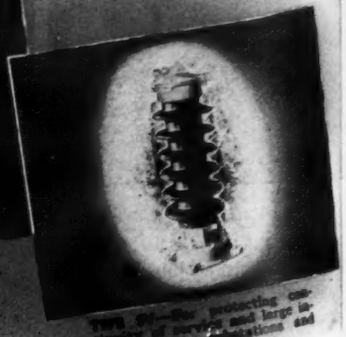


TYPE A "RE-ION" (above) and TYPE LV AUTOVALVE (right)—For protection of distribution apparatus.





TYPE HV—For outside substations, industrial establishments or cables.

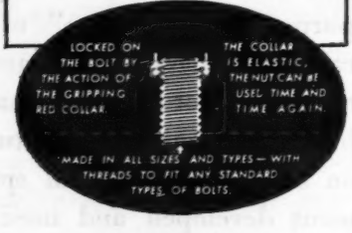


TYPE SV—For protecting entire utility or service and large industrial substations and generating plants.

THERE'S A WESTINGHOUSE ARRESTER FOR EVERY APPLICATION

A HOLD-DOWN *for Keeps*

Elastic Stop Nuts have been successfully used for hold-down bolts where security is vital. They give a positive fastening wherever there is vibration, impact, shock, stress change. Let ussend an application engineer to discuss the Elastic Stop Nut way of avoiding nut failures that may be costly both in your plant equipment and your products.


LOCKED ON THE BOLT BY THE ACTION OF THE GRIPPING RED COLLAR
THE COLLAR IS ELASTIC, THE NUT CAN BE USED TIME AND TIME AGAIN
MADE IN ALL SIZES AND TYPES—WITH THREADS TO FIT ANY STANDARD TYPES OF BOLTS.

This nut uses its head.

An Elastic Stop Nut carries its own insurance for a positive hold-down fastening — the elastic collar built into its head.

Here's how this device works:

The tough but resilient elastic collar forms itself to the individual bolt threads, grips them so tightly that the nut won't loosen up or back off even under the severest vibration.

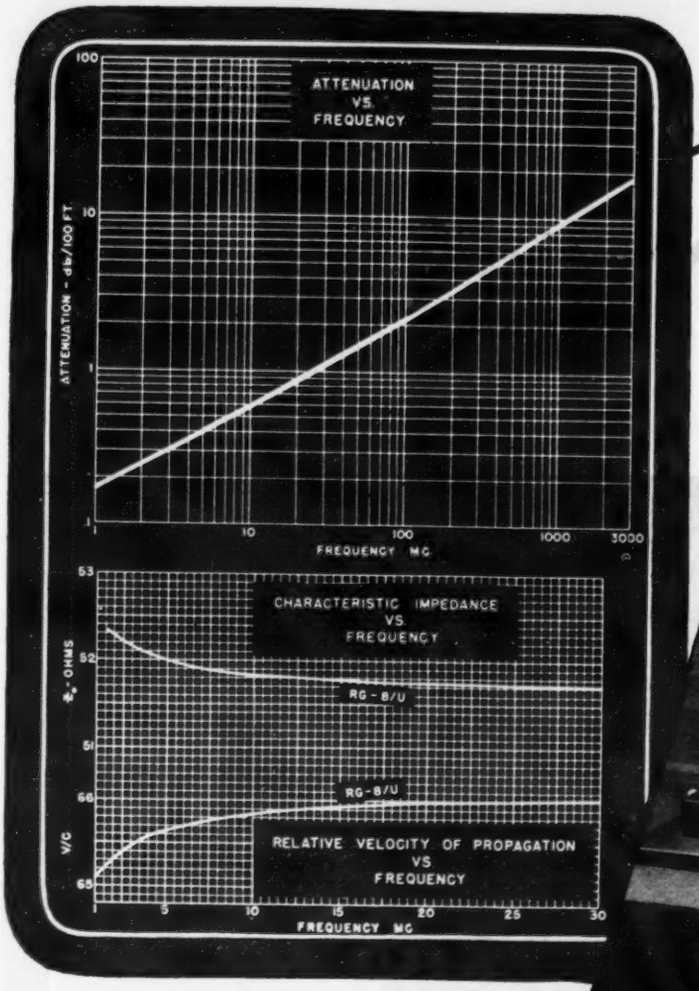
Forget about cotter pins, lockwashers or any other auxiliaries when you use an Elastic Stop Nut. That means no chance of leaving off these extras as well as saving time in assembly and servicing.

Once on, an Elastic Stop Nut stays on. And it can be used over and over again without losing the grip of its headpiece.

Result: Economy in production and economy in use.

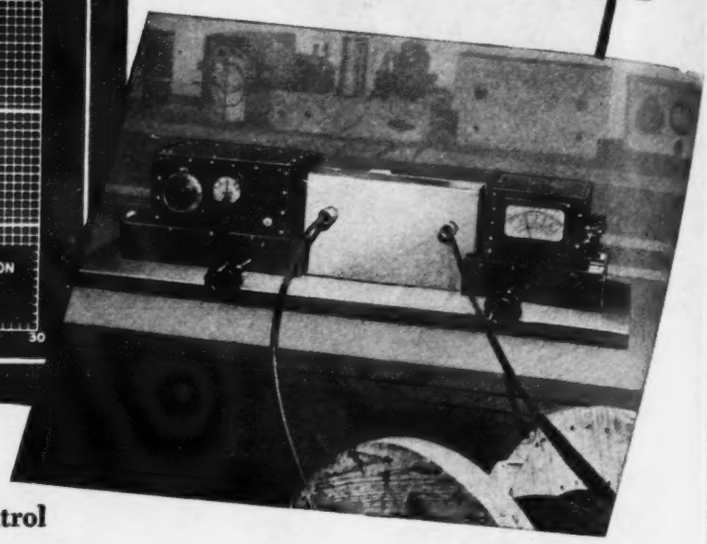
ESNA
TRADE MARK OF
ELASTIC STOP NUT CORPORATION OF AMERICA
Union, New Jersey
and Lincoln, Neb.
Sales Office—1060 Broad St., Newark 2, N.J.

ELASTIC STOP NUTS
Lock fast to make things last



HERE'S PROOF...

How Federal H-F Cable Quality is Controlled by *Actual Test*



Precision engineering—plus careful control of all manufacturing operations . . . from raw materials to finished product—mean complete reproducibility in any given Intelin Cable type . . . and overall superior cables.

Take Intelin RG-8/U for instance . . . general purpose "work-horse" of high-frequency cables. Its characteristics are shown in curves obtained—not from nominal design values—but from thousands of actual measurements on cable samples, with special equipment developed and used exclusively by Federal's Intelin Product Line.

Intelin's Attenuation Meter is an example of such equipment. It's a precision instrument . . . accurate to .1 db . . . developed by Intelin to provide a constant check on production quality and "measured" data for the equipment designer.

For additional information regarding Intelin RG-8/U . . . write *today* for Report E-53—and for cable you can count on . . . *always* specify INTELIN.

FEDERAL TELEPHONE & RADIO — FTR

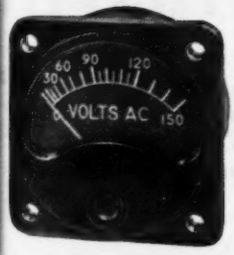
Federal Telephone and Radio Corporation

1.5" Commercial Type OD d-c Milliammeter

2.5" Commercial Type DA a-c Voltmeter. 400 cycle

New R-S Instruments—

built to Rigid Specifications



2.5" Aircraft Type AN a-c Voltmeter. 400 cycle

1.5" Aircraft Type G-1 d-c Ammeter. Immersion Proof

In the air, where life itself is at stake, no failure of instruments because of construction or assembly can be tolerated. Roller-Smith aircraft instruments have always been built to the most rigid specifications. We are naturally proud of the fact that the Army Air Forces, Air Technical Service Command has assigned us an "Approved" Quality Control Rating covering instruments delivered in accordance with contract specifications.

Commercial types of these two aircraft miniature panel instruments are built in conformity with the same exacting requirements.

ROLLER SMITH

Sales Representatives In all Principal Cities

STANDARD AND PRECISION ELECTRICAL INSTRUMENTS • AIRCRAFT INSTRUMENTS • SWITCHGEAR • AIR AND OIL CIRCUIT BREAKERS • ROTARY SWITCHES • RELAYS • PRECISION BALANCES

FREE. to Company Executives

20-page booklet showing how electronic equipment is being used in industry today—to cut costs, increase production, and improve product quality

CONTENTS—How Electron Tubes . . .

- protect workers
- analyze colors
- control lighting
- provide high-speed switching
- "time" machine-tool operations
- speed wood-bonding 700%
- sort mountains of beans
- provide split-cycle timing
- speed soldering 2400%
- direct traffic
- prevent fire and explosion
- speed surface hardening
- test springs
- dry penicillin 4700% faster
- prevent paper waste
- detect hidden flaws in metal

HERE—in convenient, easily-referred-to form—are sixteen authentic case histories, telling how different industrial electronic devices work and how they have saved time, money, and materials for many different industries. Simply written, non-technical, illustrated, these case histories contain many ideas that may be useful to you.

What the booklet can do for you

Just one of the ideas discussed in this booklet may suggest ways in which *your* company can adopt electronic methods to save money, increase production, or perform manufacturing operations not possible by other means. *No alert executive today can afford to overlook such ideas.*

Reprinted from RCA advertising

These case histories first appeared in RCA advertising. They made such a big impression on industrial executives that we found it difficult to satisfy the demand for reprints. For this reason, the most informative advertisements in the series have been reprinted in this two-color, 11 x 14 booklet called, "16 Examples of RCA Electron Tubes at Work in Industry."

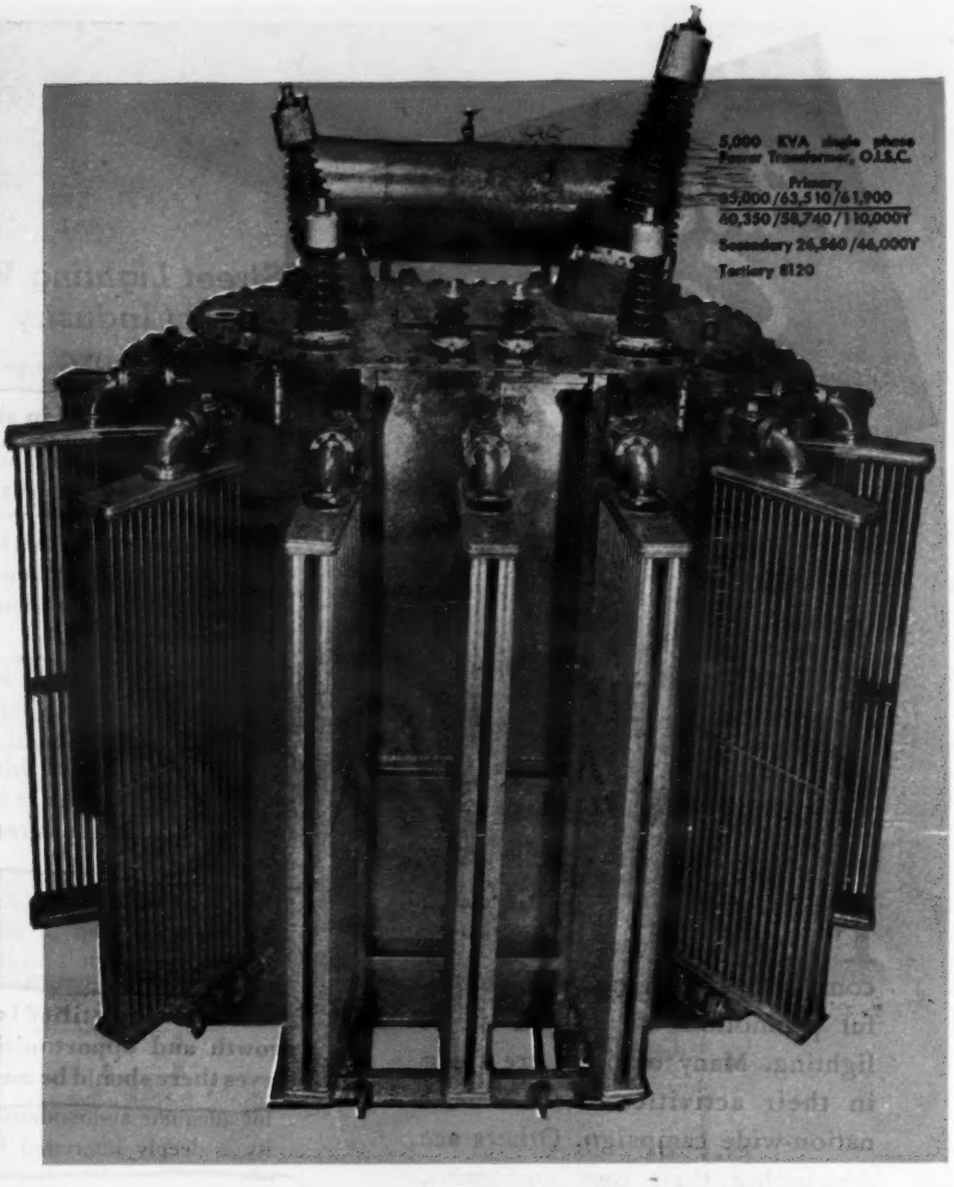
Write today

For *your* copy of this simply written, easy-to-understand, highly informative collection of case histories, write *today* on your company letterhead, giving your official title. The booklet is *free*. Send your request now to RADIO CORPORATION OF AMERICA, Commercial Engineering Section, Dept. 62-56W, Harrison, New Jersey.

The Fountainhead of Modern Tube Development is RCA

62-6936-56

AMER TRAN



UNDIVIDED ATTENTION

To Your Transformer Problem

When you submit a transformer problem to AmerTran, you draw upon the resources of the entire organization—not just a segment. For AmerTran concentrates on transformers, day in and day out, as it has for forty years.

Thus, when an AmerTran engineer studies your data, his recommendation is unhampered by consideration for other related products. The user benefits by optimum transformer performance.

THE AMERICAN TRANSFORMER CO.

AMERTRAN

MANUFACTURING SINCE 1901 AT NEWARK, N. J.

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

AMER TRAN

178 EMMET STREET
NEWARK 5 N. J.

Another Convincing Argument

. . . that now is the time to act

FROM coast to coast, an ever-increasing number of utility companies are beginning the forceful promotion of postwar street lighting. Many of them are tying in their activities with Nema's nation-wide campaign. Others are developing their own programs. The important thing is—they're doing something about this big and important job NOW. Are you?

Still Available

. . . a few free copies of "What's Ahead in Street Lighting"—a survey of utility opinion completed last year. In addition to sampling utility thinking, it indicates, by contrasting yesterday's policies with today's action, the change that has taken place in the nation's attitude toward street lighting. Write The Street Lighting Section, Nema, 155 East 44th St., New York 17, New York.

Street Lighting Will Attract Industry and Labor

AFTER TOO LONG a period of hibernation, interest in street light

interest in street lighting is waking up.

Cities w

their industrial activity and communities wondering how they can bring back their workers who were lured away

Unsafe streets at night, dimly lighted and unattractive shopping areas, and mounting traffic accidents with high insurance rates will drive away labor and industry.

high insurance rates will drive away labor and industry. After the war communities will be in competition for new industries, not so much a competition of manufacturing advantages and

High in the list of things that can make a town a good place to live in is its safety after dark and not far below it is the attractiveness of its downtown area at night.

after dark and not far below it is the attractiveness of its downtown area at night. For several years The Street and Traffic Safety Lighting Bureau has been plugging away at the night-driving hazard and while it has accomplished

Since every utility is deeply interested in the growth and opportunities of the communities it serves there should be no question about cooperation.

for adequate and modern street lighting. Since every utility is deeply interested in the growth and opportunities

It is true that improved street lighting would mean added load, but that in itself is relatively unimportant by comparison with the far greater load possibilities from a community that attracts industry and holds its workers because it is a good place in which to live.

in which to live.

Twenty-five years ago a city wasn't up to date if it didn't have a white way. But the world has moved on

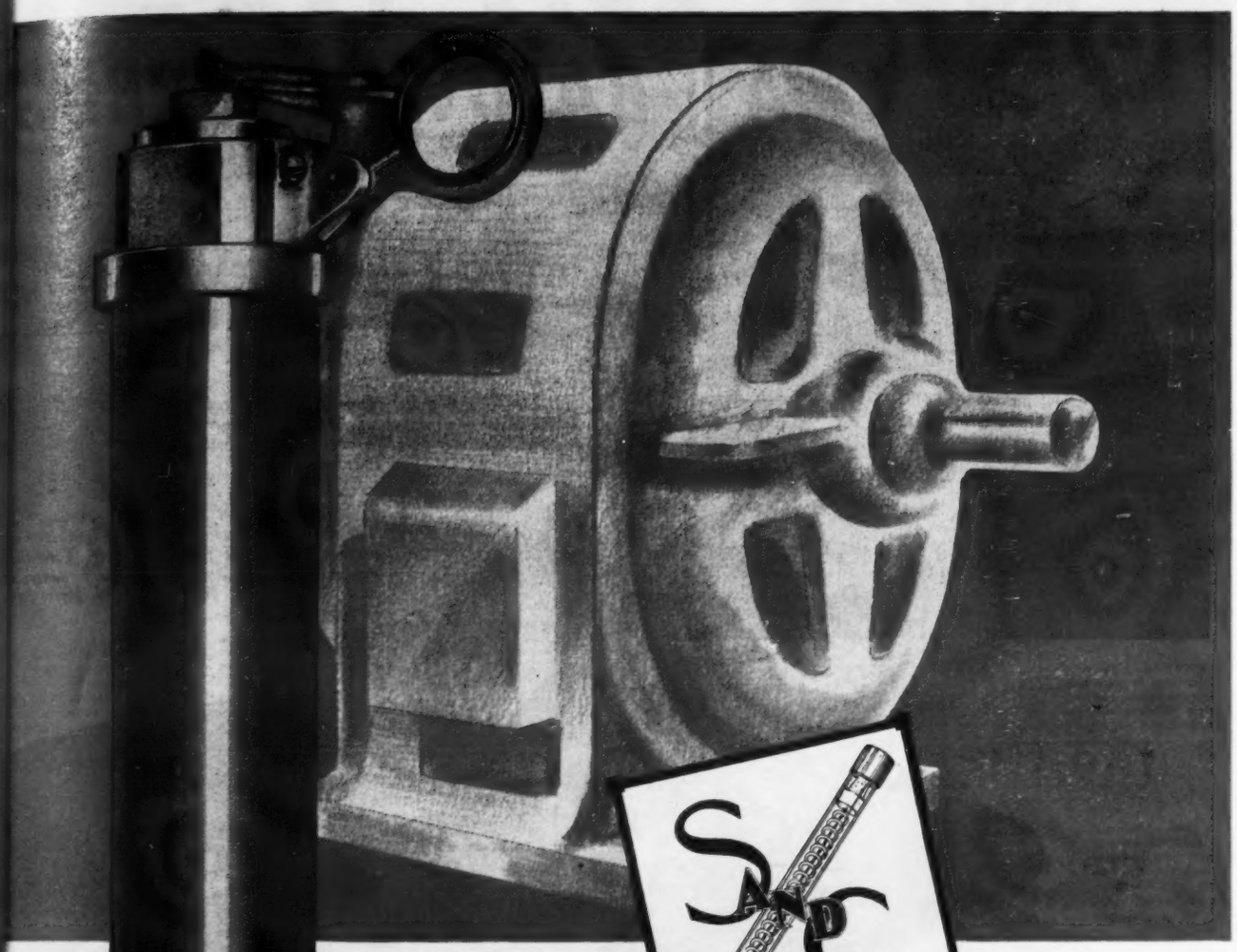
Today we need to relight all of our traffic streets.

ing now is the time to act. Feed people information that affects their home and they will not be long in demanding what is right.

Electrical World, March 3, 1945.

GOOD STREET LIGHTING BUILDS GOOD WILL

APR 23 1947



Get this better

HI-VOLTAGE MOTOR CIRCUIT

PROTECTION

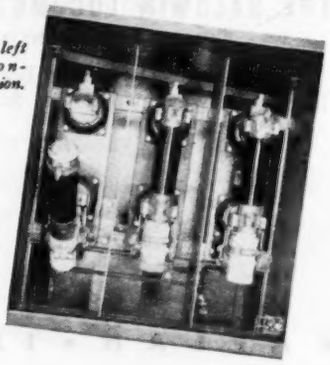
with Hi-Speed, Hi-Interrupting Capacity

S & C POWER FUSES

Hundreds of up-front heavy industrials find real savings in protection costs and service with these proven-dependable fuses. Designed to interrupt short-circuit current up to 150,000 kva at 2300 volts, their economical, practical protection is gaining rapidly widening acceptance in conjunction with hi-voltage motor control installations.

As the illustration (lower right) shows —these fuses require but little space and are arranged for easy servicing without use of special tools. To replace a blown fuse unit with a new refill is the work of but a few minutes.

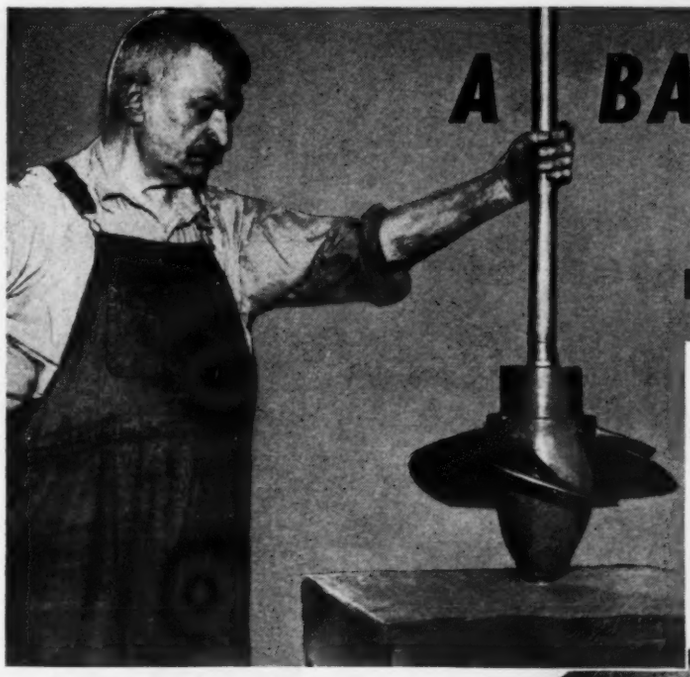
It will pay you to get the facts in new Bulletin No. 242. Write for it today.



Fuse at left in disconnect position.

SCHWEITZER & CONRAD, INC.
4423 Ravenswood Avenue, Chicago 40, U. S. A.
Represented in Principal Cities (Consult Telephone Directory)
In Canada by Powerlite Devices, Ltd., Toronto, Ont.

EXPERIENCE WILL CHOOSE AN S&C FUSE

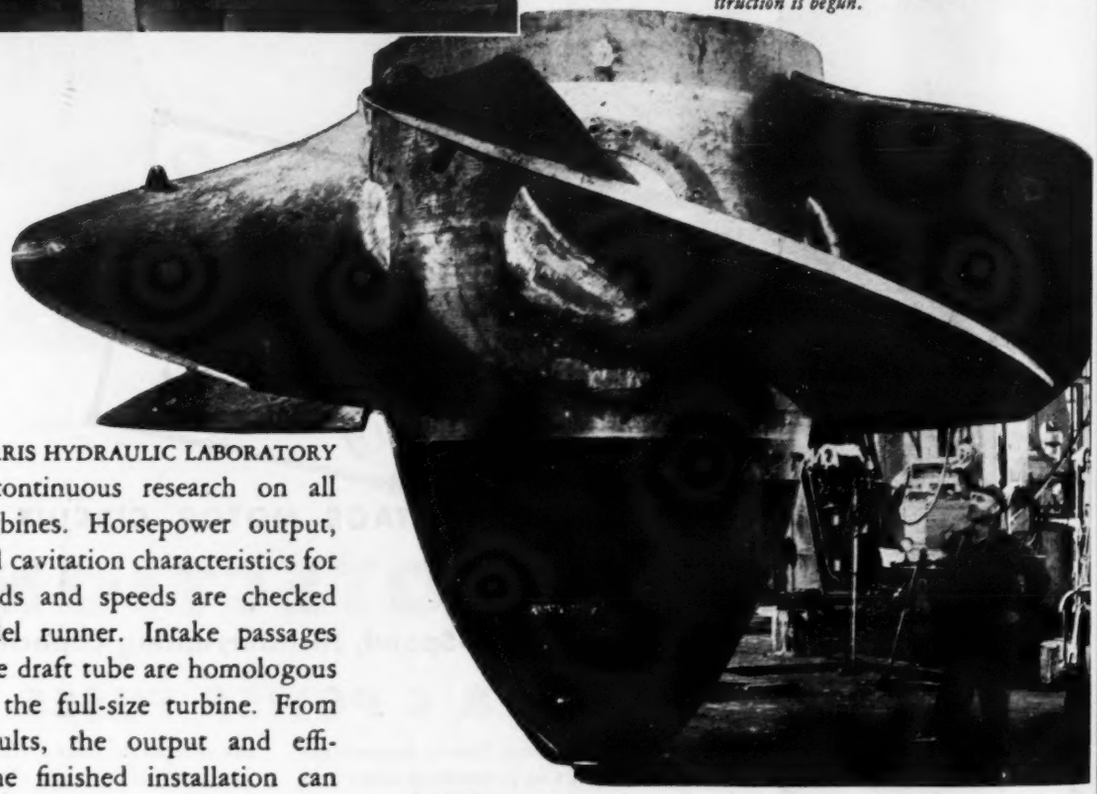


A BALDWIN TURBINE

PASSES ITS TEST BEFORE IT'S EVER BUILT

This 16-inch model runner, an exact scale duplicate in miniature of the full-size runner, is exhaustively tested in our laboratory both as to output and flow characteristics.

The test results permit an accurate forecast of the performance of the full-size runner. Theoretical design is verified, and any necessary changes or modifications can be incorporated before construction is begun.



The I. P. MORRIS HYDRAULIC LABORATORY carries on continuous research on all types of turbines. Horsepower output, efficiency and cavitation characteristics for different heads and speeds are checked on the model runner. Intake passages and discharge draft tube are homologous to those of the full-size turbine. From the test results, the output and efficiency of the finished installation can be closely predicted.

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA, PENNSYLVANIA

I. P. Morris Department, Eddystone, Pa.
The Pelton Water Wheel Co., San Francisco, Cal.

BLW THE BALDWIN GROUP

BALDWIN
HYDRAULIC TURBINES

KAPLAN • IMPULSE • FRANCIS • PROPELLER

CON-NEC-TITES

Save an Extra Connector On Every 2-Way Tap

KEARNEY
No. 4 and No. 6
CON-NEC-TITES
BUILT LONGER TO
HANDLE 3 CONDUCTORS
Kearney's strong hexagonal head provides firm wrench seating — prevents slipping.
Kearney's clean threads and correct slot width provide smooth engagement — prevent stripping and binding on conductors.
Kearney's long V-groove surfaces in washer and head assure maximum conductivity and eliminate bent conductors.
Kearney Thread Pilot makes possible easy starting. Elimination of excess threads makes possible easy removal of nut.
Kearney's rounded edges won't cut gloves or nick conductors.
2-WAY SERVICE
FORMERLY
REQUIRED
2 CONNECTORS

THE majority of 2-way service taps are made on No. 4 and No. 6 conductors. That's why Kearney Forged Con-Nec-Tites are made longer in these sizes — to handle three wires — to save an extra connector on every 2-way tap. As a result, Kearney No. 4 and No. 6 Con-Nec-Tites are real time and money savers.

Other Kearney Con-Nec-Tites from 1,000,000 CM to No. 10 will handle two conductors of any combination of copper, iron, or aluminum.

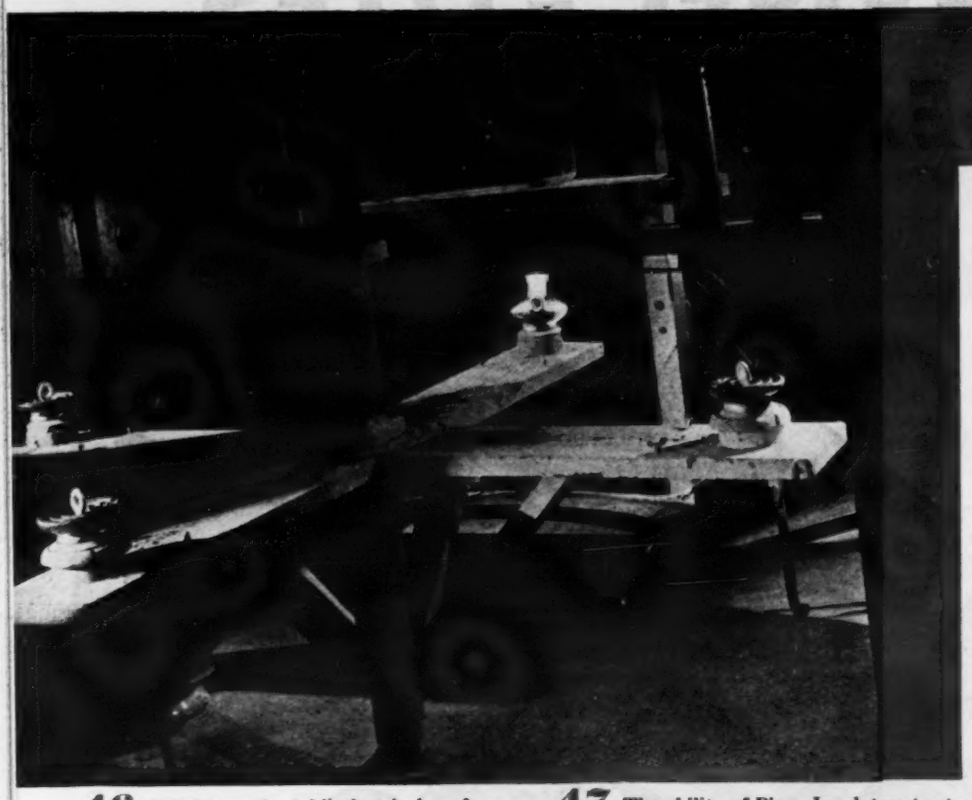
It will pay you to standardize on the complete line of Kearney Con-Nec-Tites.

Makers of the Original Split-bolt Solderless Connector

JAMES R. KEARNEY CORPORATION

OVERHEAD **UTILITY EQUIPMENT** UNDERGROUND

4224-42 CLAYTON AVE., ST. LOUIS 10, MO. • CANADIAN PLANT: LEASIDE, ONTARIO



PINCO
INSULATORS

In the standard tests to which all Pinco Insulators are subjected, years of line service under the most difficult conditions are duplicated. Electrical surges that would represent the thunderstorms of many summers . . . mechanical tests that outdo the punishment of gale-swung ice-coated wires . . . all are piled one on top of another to make sure that every Pinco Insulator will be "*Right On The Job*".

Write for your copy of the Pinco Catalog showing Pinco Standard Insulators and Hardware.

Pinco Standard Insulators are cataloged in the Electrical Buyers Reference.

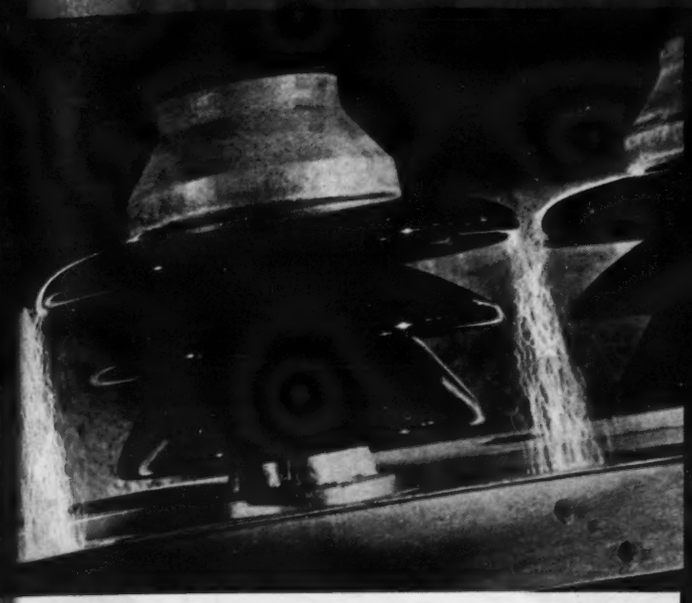
This is the ninth in a series of advertisements showing how Pinco Insulators are made by the wet plastic process in which all forming operations are performed with the clay in plastic state.

46 "Right on the job" electrical performance of Pinco Insulators is insured by tests such as this. Here Pinco No. 1510 Insulators are being subjected to a high frequency flash-over test. This is performed on a Pinco designed motor-operated turntable which mechanizes and speeds up this testing operation.

47 The ability of Pinco Insulators to stand up under unusual electrical line surges is assured by severe electrical tests. Following routine mechanical tests insulators are given a final 60 cycle flash-over test. The No. 1060 Pinco Insulator shown here must stand up under 80,000 volts for 5 minutes.

Suspension Insulators . . . . Switch & Bus Insulators . . . . Distribution Pin Types and Guy Strains . . . . One Piece & Multi-part High Voltage Pin Types . . . . Suspension & Strain Clamps . . . .

What's Behind "RIGHT on the job" service?



48 160,000 volts are applied to the No. 735 in the final 60 cycle test. Each part of this insulator has also been tested electrically before assembly.

49 An exclusive feature of Pinco Pin Type Insulators is the rolled thread which insures ease of installation and a good mechanical fit. Here a Pinco inspector is shown checking the pitch and taper of the thread with a specially designed gauge.

50 Head thickness is important in an insulator, and each part must be accurately gauged. Uniformity here means uniform mechanical and di-electric strength in actual use. Precision depth gauges such as that shown here help maintain the uniform accuracy that characterizes all Pinco Insulators.

Pinco Transformer Bushing
No. 2557
8.6 KV

The Porcelain Insulator Corporation

671 Main Street, Lima, New York

SALES AGENTS—JOSLYN MFG. & SUPPLY CO., Chicago 6, Ill.; Kansas City 16, Mo.; Monticello 2, Ind.; Omaha 4, Neb.; Springfield, Ill.; The Joslyn Company, New York 5, N. Y.; Baltimore 25, Md.; Philadelphia 2, Pa.; Richmond 21, Va.; Rochester 10, N. Y.; Washington 8, D. C.; South East Joslyn Co., Cincinnati 7, Ohio; Atlanta 3, Ga.; Cleveland 13, Ohio; Jacksonville, Fla.; Lexington, Ky.; Jobbers Supply Company, St. Paul 4, Minn., Portland 9, Ore.; Seattle 4, Wash.; Southern Joslyn Co., New Orleans 19, La.; Joslyn Southwest Co., Dallas 1, Tex.; Houston 4, Tex.; Joslyn Co. of California, Los Angeles 11, Calif.; San Francisco 3, Calif.; H. E. Burns, Pittsburg, Pa.; Paul A. Douden Co., Denver 2, Colo.; Paul Carson, Amarillo, Tex.; J. J. Costello, Boston 16, Mass.

Distribution Clamps . . . . Transmission Line Fittings . . . . Transformer & Circuit Breaker Bushings . . . . Indoor Bus Support Porcelain . . . . Tree Insulators . . . . Lightning Arrester Porcelain

CLOSING OUT!

VICTORY LINE OF WOOD-BACK RACKS

QUICK DELIVERY

LOW PRICE

While they last—we offer our complete remaining stock of two-point and three-point WOOD-BACK RACKS at a *low price* for *quick sale!* Immediate shipment!

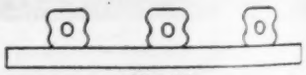
These Racks were made according to Army Construction specifications. The Wood-Back Bars of these racks are of indestructible white oak, 2½" wide x 1⅝" thick, treated with a permanent toxic water-repellent wood preservative. Mechanical strength far above standard safety margins commonly established by the industry. Thousands of these racks are in service on jobs throughout the United States today.

This offer limited to the quantity on hand. Rush your order today—first come, first served!

No. 322

2-Point WOOD-BACK RACK

45¢ each



No. 323

3-Point WOOD-BACK RACK

65¢ each

Prices F.O.B. our factory

PORCELAIN PRODUCTS, Inc.

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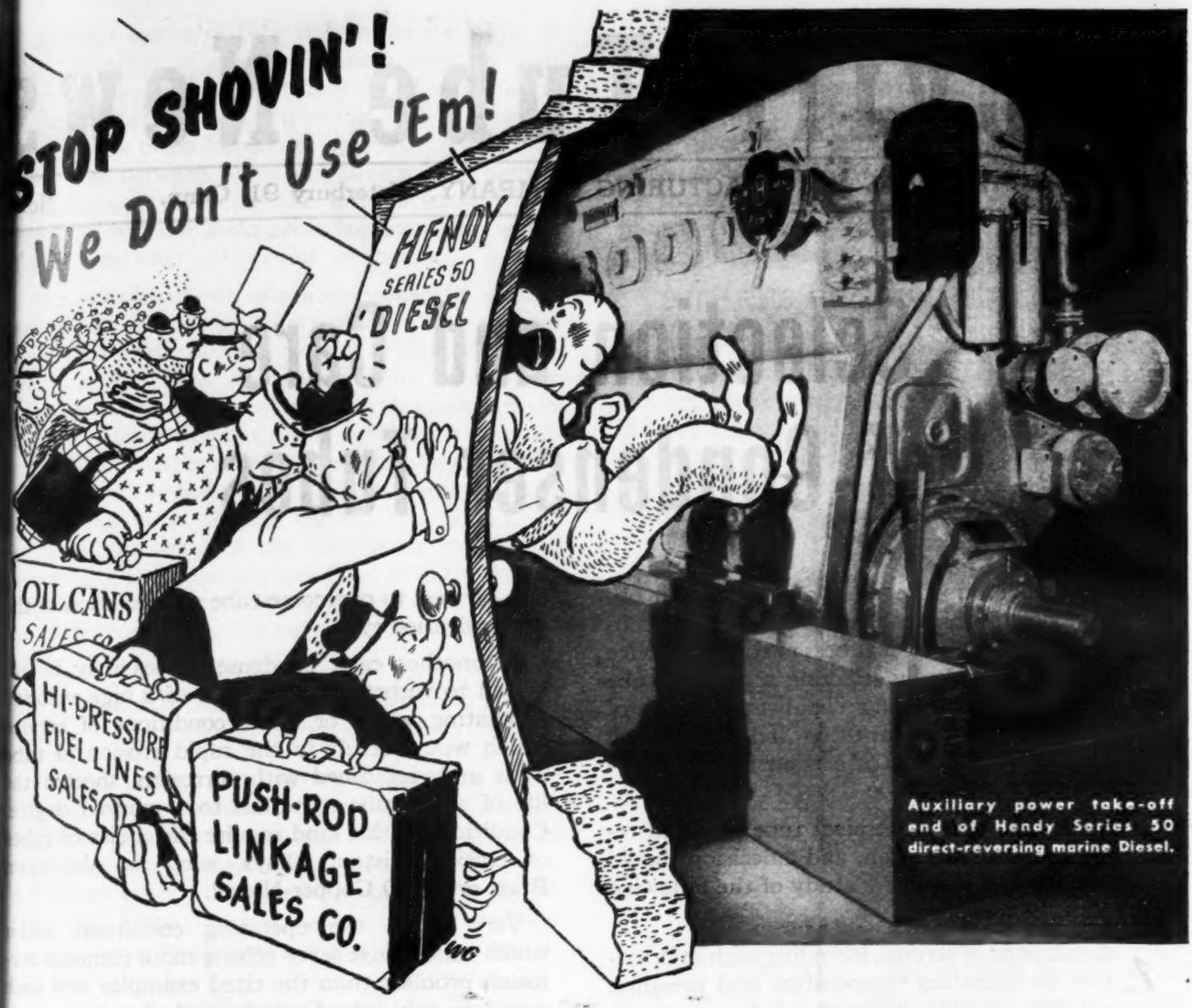
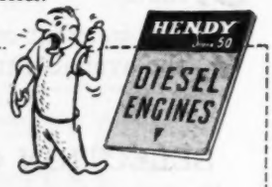

STOP SHOVIN'!
We Don't Use 'Em!
HENDY SERIES 50 DIESEL
OIL CANS SALES CO.
HI-PRESSURE FUEL LINES SALES
PUSH-ROD LINKAGE SALES CO.
Auxiliary power take-off end of Hendy Series 50 direct-reversing marine Diesel.

You won't find high-pressure fuel lines or long push rods on a Hendy Series 50 Diesel. Although built for heavy-duty economical service, it's also designed for real convenience to the Diesel operating or maintenance engineer.

The overhead camshaft reduces maintenance on valve assemblies. Combination fuel pumps and injectors are easily accessible. Starting is easy—injector fuel lines need no bleeding. And there are many other features.

Now, for the first time, you can have the benefit of *all* these features in one tested and reliable Diesel. For complete information, mail the coupon today to Joshua Hendy Iron Works, Sunnyvale, California.



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Mail me your new booklet that completely describes the Series 50 Diesel, with photographs and cross-section cutaway drawings showing the design of all major parts.

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I'm interested in Marine ☐ Stationary ☐ Diesel-electric ☐ models and in hp ranges from 190-250 ☐ from 250 up ☐

102-D-20

Scovill Tube News

Vol. 3 SCOVILL MANUFACTURING COMPANY, Waterbury 91, Conn. No. 2

Selection and Care of Condenser Tubes

Operating engineers are vitally interested in obtaining long trouble-free service life from condenser and heat exchanger tubes; maximum service can be expected only by selecting a suitable tube material for the particular application and, of equal importance, by instituting and maintaining practices for the control of certain types of corrosion.

The choice of an economical tube material requires careful consideration, and a decision should be based on the results of a study of the following controlling factors:

1. Conditions of service, including such information as operating temperature and pressure, velocity of media contacting tubes, composition of solutions, gases, vapors, being handled.
2. Previous service experience with tubes in a particular unit or similarly operated units.
3. Type or form of corrosion which predominates.
4. The inherent corrosion-resistant properties of the available tube materials.

SELECTION OF TUBE MATERIAL

Engineers have a choice of a large number of non-ferrous alloys for condenser and heat exchanger tubes. These alloys vary considerably in composition, chemical and physical properties and their ability to withstand certain types of corrosion. In many cases, the selection of a satisfactory tube material is not a difficult matter. As an example, under conditions where dezincification of condenser tubes is the major problem, the use of a dezincification-resistant tube alloy — Phosphorized Admiralty metal — is indicated; under a somewhat more limited set of conditions, Red Brass, Arsenical Copper or Deoxidized Copper may also be used to overcome tube deterioration of the dezincification type.

In another case, condenser tubes may be required to withstand the action of a high velocity circulating water or other conditions of service which would result in the rapid erosion of tube walls and, combined with corrosion, shorten the life of some tube materials to a marked degree. Conditions of this kind require the choice of tubes of erosion-resistant alloys, such as Aluminum Brass or 70–30 Copper-Nickel.

Very often, the operating conditions under which tubes must serve offer a more complex corrosion problem than the cited examples and such cases are only solved satisfactorily by close attention to all contributing factors to corrosion.

ATTENTION TO CONTRIBUTORY FACTORS

Many condenser tube corrosion problems can best be controlled by eliminating or correcting the factors contributing to corrosion. This is especially true in installations where certain types of corrosion are active. In cases of tube failures which can be attributed to "deposit attack", freedom from such attack cannot be assured by a change in tube alloy. "Deposit attack" of tube surfaces is initiated by foreign materials which are carried into the tubes by the circulating medium and become lodged on the tube walls; such materials as coal or coke, clinkers, stones, wood, paper, shells or other marine growths may contribute to this form of corrosion under certain conditions of service. Intense local pitting and downstream erosion-corrosion, characteristic of attack at and adjacent to foreign deposits, can be prevented or minimized by two expedients — adequate screening of the circulating water and a periodic thorough careful cleaning of the tubes.

Another source of tube failure has its origin in the formation of electro-chemical cells at local areas of the tube walls; this form of corrosion is called "concentration cell action." Corrosion of this type is often formed at recessed areas which may exist between tubes and tube sheets, baffles, and support plates, or at any location where cracks, crevices or other areas are found into which liquids may seep and become trapped.

Concentration cell action may also be experienced beneath porous layers of scale or corrosion product over the metal surface or at discontinuities in protective films or coatings. The remedy for overcoming corrosion of this kind again lies in certain definite precautionary or corrective measures rather than in a change in tube alloy. Briefly, all recesses, crevices, etc. at tube surfaces between tubes and tube sheets, baffles, etc. should be avoided; screening of the circulating media and cleaning of the tubes are beneficial as in the case of deposit attack; lastly, effective chemical treatment of media contacting the tubes has been helpful in many cases.

CHANGE IN OPERATING CONDITIONS

Certain unexpected corrosion problems often develop during the service life of tubes. It is not unusual to find that operating conditions change in some respect and such changes are then reflected in a different type of tube attack to that normally experienced. Thus, tube installations which have been trouble-free, may suddenly show evidence of serious corrosion.

Periodic inspection of tubes and prompt action in diagnosing the possible sources of trouble under such circumstances will often lead to remedial measures which can be applied to arrest an otherwise corrosive action on the tubes.

In some instances, as an illustration, the tubes in a unit will suddenly show definite evidence of inlet end attack although no trouble of this kind had previously been experienced. At the first indication of this trouble, a study can be made to determine what particular conditions of service are causing it, and this study can be followed by definite recommendations for alleviating the attack. If such recommendations cannot be carried out for any reason and the attack continues, a suitable coating of paint or cement can be applied to the inlet ends periodically to stop the action. More permanent relief in severe cases can be obtained by the use of properly designed metal or plastic inserts to cover affected tube areas.

THREE SCOVILL SERVICES

The foregoing information on the selection, use and care of condenser and heat exchanger tubes has been necessarily brief. The subject is covered in more detail in the Scovill Condenser Tube booklet, a copy of which will be sent upon request to Scovill Manufacturing Company, 24 Mill Street, Waterbury 91, Connecticut.

Information like this, regularly provided through "Scovill Tube News" and printed literature, is part of *Service in Manuals* — one of three Scovill services.

The other two are *Service in Men* which brings you, through Scovill engineers, specialized consultation on tube problems and installation methods . . . and *Service in Metals* which covers the selection of alloys and study of specific problems in the field and in the laboratory.

ARMY E NAVY

THIS IS NUMBER FIFTEEN in a Series of Scovill Advertisements to help you get longer life from condenser and heat exchanger tubes.

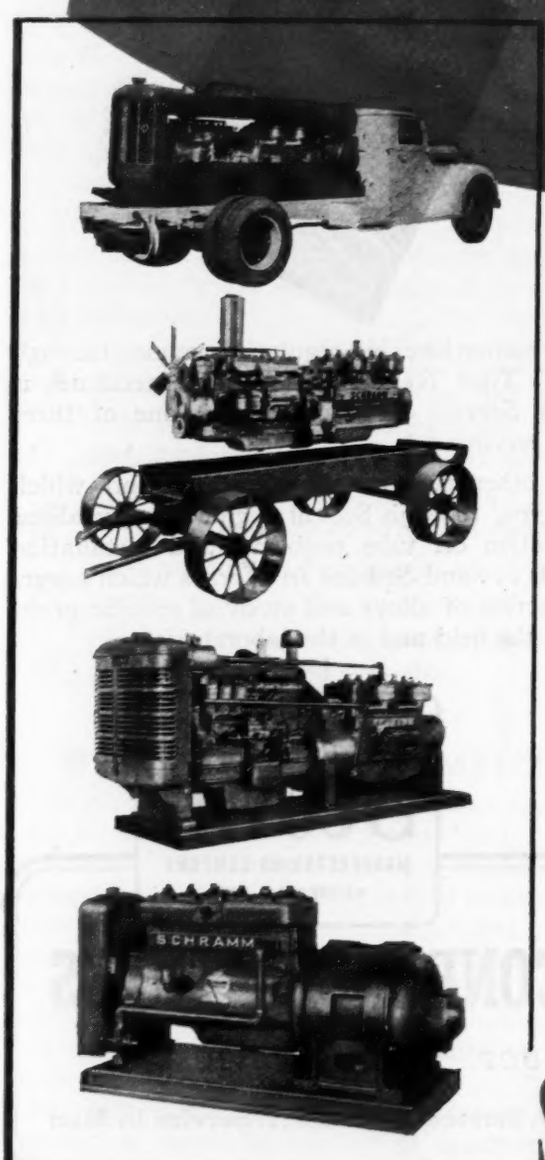
Scovill
MANUFACTURING COMPANY
WATERBURY 91, CONN.

SCOVILL CONDENSER TUBES

ONE PRODUCT . . . THREE SERVICES

Service in Manuals . . . Service in Metals . . . Service in Men

Compressed Air where you want it



THERE'S A SCHRAMM FOR EVERY COMPRESSED AIR JOB IN STEAM PLANTS . . . GENERATING STATIONS . . . FIELD WORK!

Four of the many types of Schramm Air Compressors are shown here. In every Schramm, all you have to do is push a button—and get all the compressed air you want!

This means there's a Schramm Air Compressor for Utilities no matter what the job. Schramm units, both portable and stationary, are extensively used by the utility field in general field service, repair shops, generating stations, and steam plants.

Schramm features include: (1) 100% water cooled to provide ideal performance both winter and summer (2) main bearings for every cylinder (3) mechanical intake valve (4) more cylinders and lighter parts (5) forced feed lubrication.

These, and other features, make Schramm the *preference* in leading industries, one being the Utility. Schramm offers so many savings, why not write for literature today. Ask for Bulletin #PUB—44.

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Supplying uniformly dependable pole line hardware to the

ELECTRIC POWER INDUSTRY

With all facilities devoted to the uninterrupted production of pole line hardware SEYLER is cooperating wholeheartedly with the industry to meet your essential needs.

And we are prepared to work with you on future plans for rebuilding inventories—for changeovers—for line extensions to provide still better urban and rural electric service.

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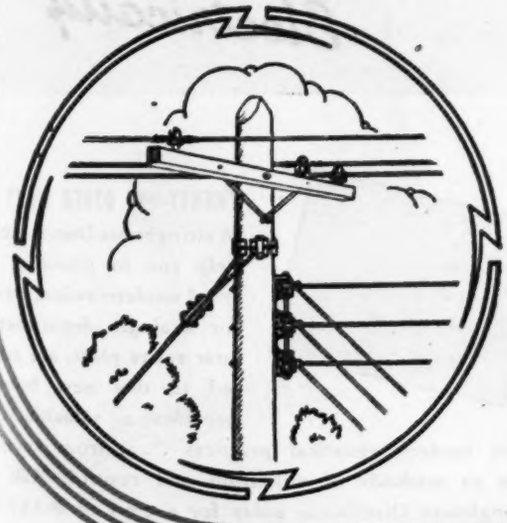
Send for SEYLER Catalog No. 43, an up-to-date catalog and design handbook.

Have you received the Seyler comparative Stock List?



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Pittsburgh, Pa.

Seyler Manufacturing Company
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PROTECTS ITSELF COMPLETELY

TO KEEP YOUR POWER SERVICE *Up to par*

Power failures due to transformer outages are unnecessary hazards to production. To meet the standards of efficiency established by today's modern war-built plants, such risks must be eliminated—and can be.

Westinghouse CSP Distribution Transformers, available from your Westinghouse Distributor, are *completely self-protecting.* They are protected against dangerous overloads, against short circuits, and against lightning. They assure a continuity of power service which is vital to efficient operation.

CSP Transformers offer just one of many ways your Westinghouse Distributor can help you to bring your plant up to par electrically. He can tell you what's new about a lot of other things electrical, too . . . can suggest many practical ways to modernize or "revitalize" old equipment or methods to your advantage. Call on his help for a complete electrical checkup! J-70447

. . . ONE OF 22 WAYS YOUR WESTINGHOUSE DISTRIBUTOR CAN HELP YOU MODERNIZE *Electrically*

TWENTY-ONE OTHER WAYS your Westinghouse Distributor can help you in planning electrical modernization, whether for a single department or your entire plant, are suggested in this new book. It provides a valuable check list on modern electrical practices . . . from incoming power to methods of utilization and control. Ask your Westinghouse Distributor today for a copy of B-3476. Or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

with

POLES SCARCER THAN STEEL

make them last longer with

OSMOPLASTIC

When you read about the Army switching back from wood to steel ammunition cases, you realize just how critical the pole situation is today.

It seems wisdom then to utilize every possible means of conserving and lengthening the life of your standing poles. **OSMOPLASTIC** fills this need perfectly. Important, too, it is easily and simply applied as poles are inspected.

We are equipped to handle your groundline treating with Osmoplastic on a contract arrangement with our own supervised crews, or we can furnish Osmoplastic for your own application. Record systems as described above are available. Write for complete information, technical data and prices.

MAKE INSPECTION TIME, PROTECTION TIME WITH

OSMOPLASTIC

MANUFACTURED BY

OSMOSE WOOD PRESERVING COMPANY OF AMERICA, INC.

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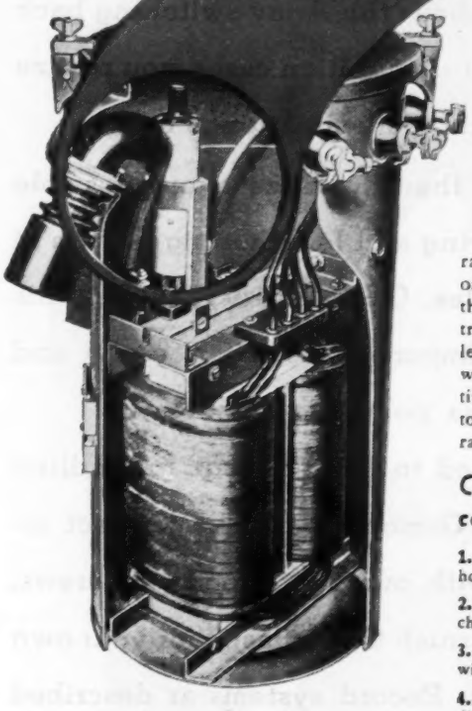
New, Improved Tap-Changer

NOW FURNISHED ON

Wagner

DISTRIBUTION TRANSFORMERS



Type HEX distribution transformer, one of the various types of Wagner distribution transformers which is equipped with the new, improved tap-changer.

WITH the addition of the new, improved tap-changers on Wagner distribution transformers, Wagner engineers have again increased the dependability of the transformer and at the same time have added to the ease and convenience of operation.

Tap-changers, or ratio adjusters, are used to provide a means of changing the voltage ratio when the transformer is de-energized. In order that this may be done quickly and effectively, the new tap-changers on Wagner distribution transformers are mounted with handle and clearly legible dial above the oil level. The tap-changer with its snap-action spring-set roller insures positive and accurate contacts. It is no longer necessary to reach into the hot transformer oil when voltage ratios must be changed.

Check the advantages revealed in the construction details as shown below.

1. Deep-knurled molded bakelite dial handle is easy to hold and turn.

2. White raised indicator positions for quick, accurate changes.

3. Large pointer indicates tap position in accordance with etched connection on the transformer nameplate.

4. Insulating tube connects and insulates the bakelite dial handle from the tap changing mechanism.

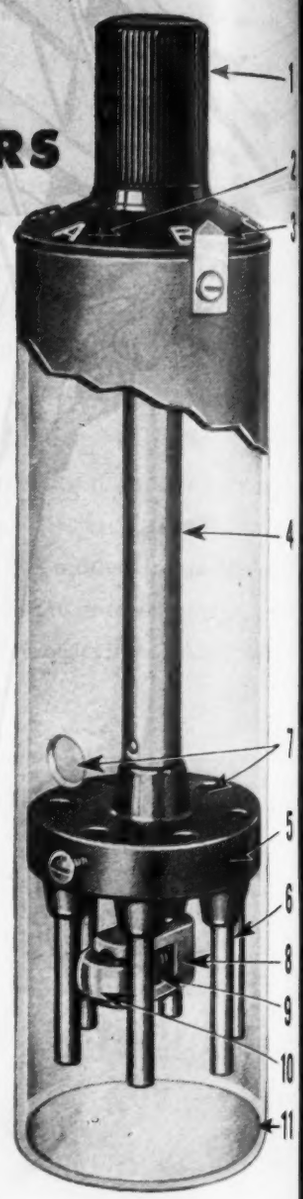
5 & 6. The bakelite stationary contact holder (**5**) is cast with the stationary contacts (**6**) in place, thus making a mechanically uniform assembly with liberal creepage distances between contacts.

7. Holes are provided so as to allow free circulation of oil.

8, 9, & 10. The movable contact assembly (**8**) is provided with a carefully designed spring (**9**) which exerts a predetermined pressure against the contact roller (**10**) so as to provide a positive contact between the bridged stationary contacts. This spring-set roller operates with a snap-action that assures correct position and positive contact for each tap selected.

11. Bakelite tube is used to house the assembly and to provide an insulating member between the tap-changer mechanism, the operating dial, and the mounting bracket.

[This type of tap-changer is now furnished on 50-kva and smaller 2400-V, and 100-kva and smaller 15000-V.]



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T45-14

TRANSFORMERS are but one of several WAGNER PRODUCTS serving industry. Other WAGNER PRODUCTS:

AIR BRAKES • BRAKE LINING • HYDRAULIC BRAKES • INDUSTRIAL BRAKES • INDUSTRIAL BRAKE CONTROLS • NoRoL • TACHOGRAPH (Recording Speedometer) • ELECTRIC MOTORS

Wagner Electric Corporation

ESTABLISHED 1891

6456 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

The G & W catalog binder is a valuable reference library because the data on equipment is detailed and accurate. It is easy to find what is needed. Potheads, Boxes, Oil Fuse Cutouts, Subway Oil Switches and Disconnects, Multitaps & Cable Splicing Kits, are all included in the Cable Accessories listed.

Use the G & W catalog when laying out your plans and when ordering devices for your cable installations.

G&W ELECTRIC SPECIALTIES

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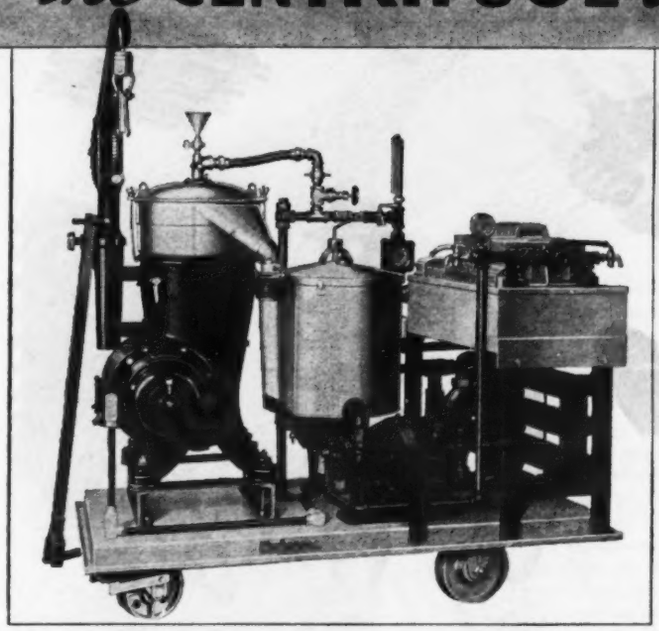
For MOST ECONOMICAL *Insulating Oil Dehydration* the CENTRIFUGE *does all the work*



The De Laval Insulating Oil Purifier removes moisture solely by centrifugal force—without the aid of a filter press. Why is this fact so important in assuring most economical maintenance of insulating oil?

BECAUSE - Centrifugal force alone, as applied within the De Laval Purifier, so thoroughly dehydrates low testing oil that the dielectric strength of the oil is completely restored at a single pass through the machine, and the hazards of operating supplementary equipment are virtually eliminated.

Should a blotter press be used to remove colloidal carbon (sometimes necessary in purifying badly carbonized breaker oil), use of the De Laval Purifier insures that only dry oil will reach the press. Consequently, blotters need be changed less often—saving time and labor—and the danger of a watersoaked blotter puncturing to spoil a run of oil is practically eliminated.

When purifying transformer oil, the De Laval Centrifugal works alone and unaided—delivering oil of higher test at greater capacity—with the very minimum of attendance.

- Send for additional details.

ADVANTAGES OF DE LAVAL INSULATING OIL PURIFIERS

Constant high purifying efficiency —no shutdowns for cleaning or for renewal of parts during run

•

More economical to operate

•

Removes water without aid of filter press; press used only to remove colloidal carbon

•

Higher daily capacity of purifier saves maintenance costs

•

Dehydrates at a single pass—no re-running

•

Low temperature purification; high dielectric value of oil maintained longer

•

Heater cannot carbonize the oil

•

Safest—continuous discharge of water prevents re-contamination of the insulating oil

DE LAVAL

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Sudden Death to Termites—

But Harmless to Farm Livestock of all Kinds

For FULL PROTECTION Choose LIFE-SPAN CEDAR POLES

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SOLD ONLY BY FOLLOWING:

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In pentachlorophenol, science has found the perfect answer to long term, full length preservation of cedar poles. To protect the pole against termites and decay organisms, such a small amount of this preservative is necessary, that it is harmless to farm livestock. The treating solution is more readily absorbed in the wood than any other preservative commonly used for treating poles, leaving practically no free toxic material on the surface available to livestock.

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LINE POSTS ARE GOOD INSULATORS

Because of

VACUUM PROCESS PORCELAIN and SPECIAL LAPP TECHNIQUE

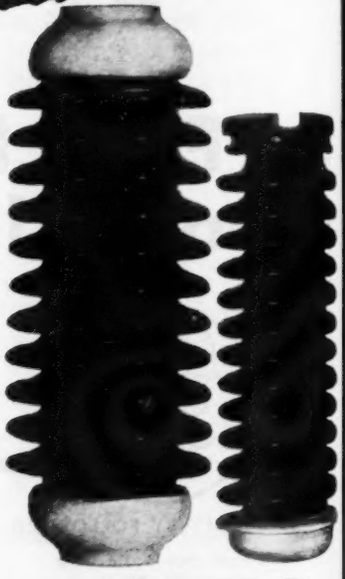
Until Lapp's success of Line Post and Station Posts was an evident accomplishment, this design was "impossible of efficient production" in American ceramic plants. Lapp's ability to produce Posts as well as other difficult ceramic shapes is due to original Lapp techniques. One of these is Vacuum Process, a method whereby air, both as bubbles and in solution, is removed early in the clay-handling procedure. Subsequent operations of pugging, throwing, jiggering, plunging and turning are thus made possible, without danger of laminations, weaknesses or cracking. The same techniques which made Lapp Post insulators possible are back of Lapp's promise for *better porcelain for all your insulator requirements.*

LINE POST LINES ARE GOOD LINES

Because

THEY REQUIRE LESS CLEANING

To provide fog-type corrugation was a primary consideration in the original Line Post design. This multi-petticoat arrangement provides a *uniform* leakage path, not subject to the "hot-spots" that cause so much failure of conventional insulators. Wind and rain go a long way toward keeping the Line Post and Station Post clean, and even under worst conditions, cleaning can be reduced to a very infrequent routine.



Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N.Y.

APR 23 1947

FLATTENED

U BOLT *construction*

won't crush even *extra flexible* wire strands!

BURNDY VARILINE ELECTRICAL CONNECTORS

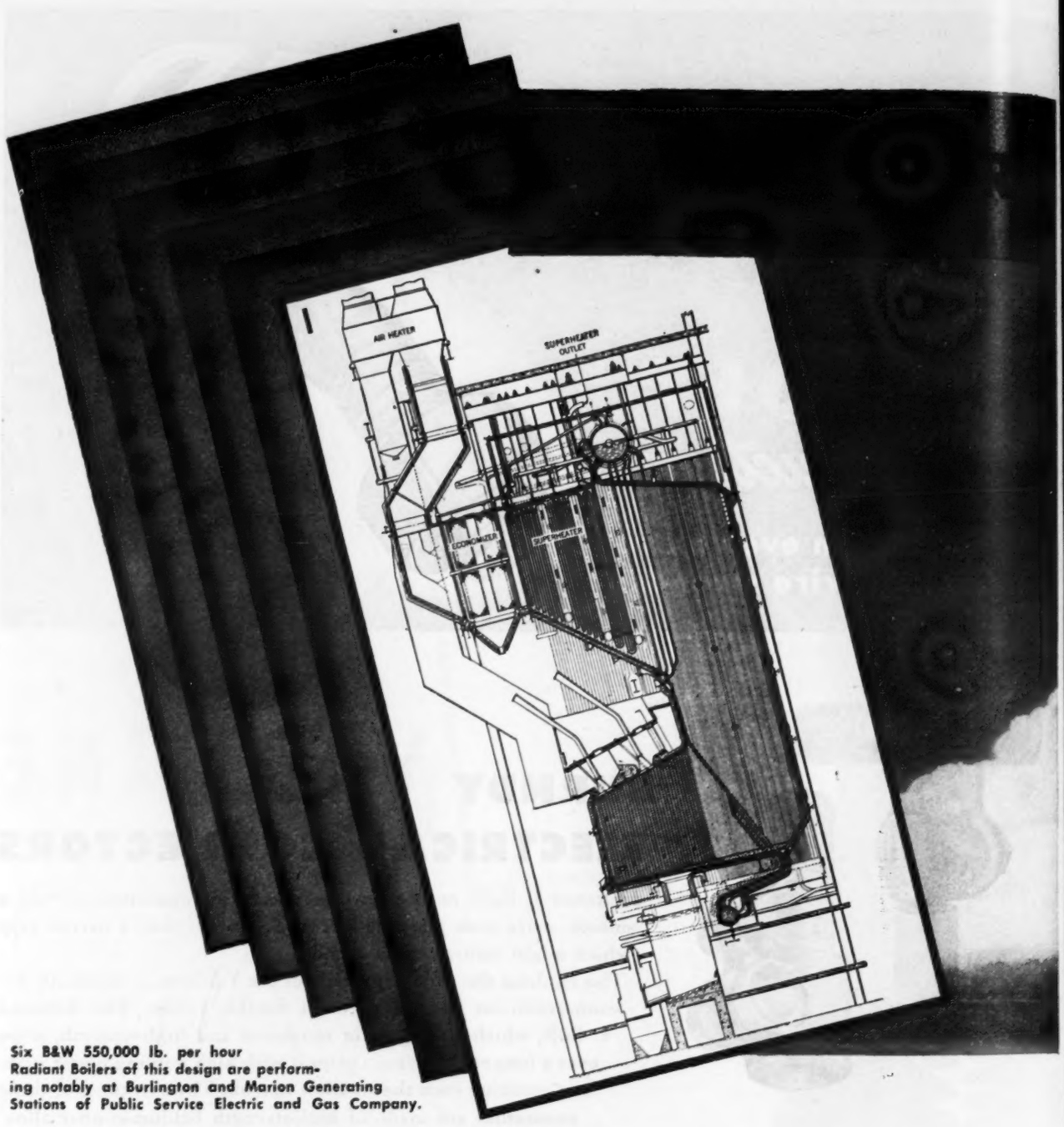
Flattened U Bolts on the Variline electrical connectors provide a smooth, *extra wide* gripping surface . . . rather than a narrow grip which might damage cable strands.

This explains the wide popularity of the Variline . . . especially for connections on flexible or extra flexible cables. The flattened U Bolt, which is forged for toughness and high-strength, grips over a *long* cable area . . . grips it with high holding power without crushing even the smallest strands. The cast parts of these connectors are made of high-strength lithium-copper alloy.

Variline connectors are available as terminals, tees, links, educers, studs and many other combinations; for cables rom #8 up to 2000 Mcm. Each individual connector accommodates a wide range of cable sizes. Thus, a small stock takes care of many requirements. Send for all the facts. Write to . . . Burndy Engineering Company, Inc., 107-J Bruckner Boulevard, New York 54, N. Y.

Headquarters for CONNECTORS

Burndy



Six B&W 550,000 lb. per hour Radiant Boilers of this design are performing notably at Burlington and Marion Generating Stations of Public Service Electric and Gas Company.

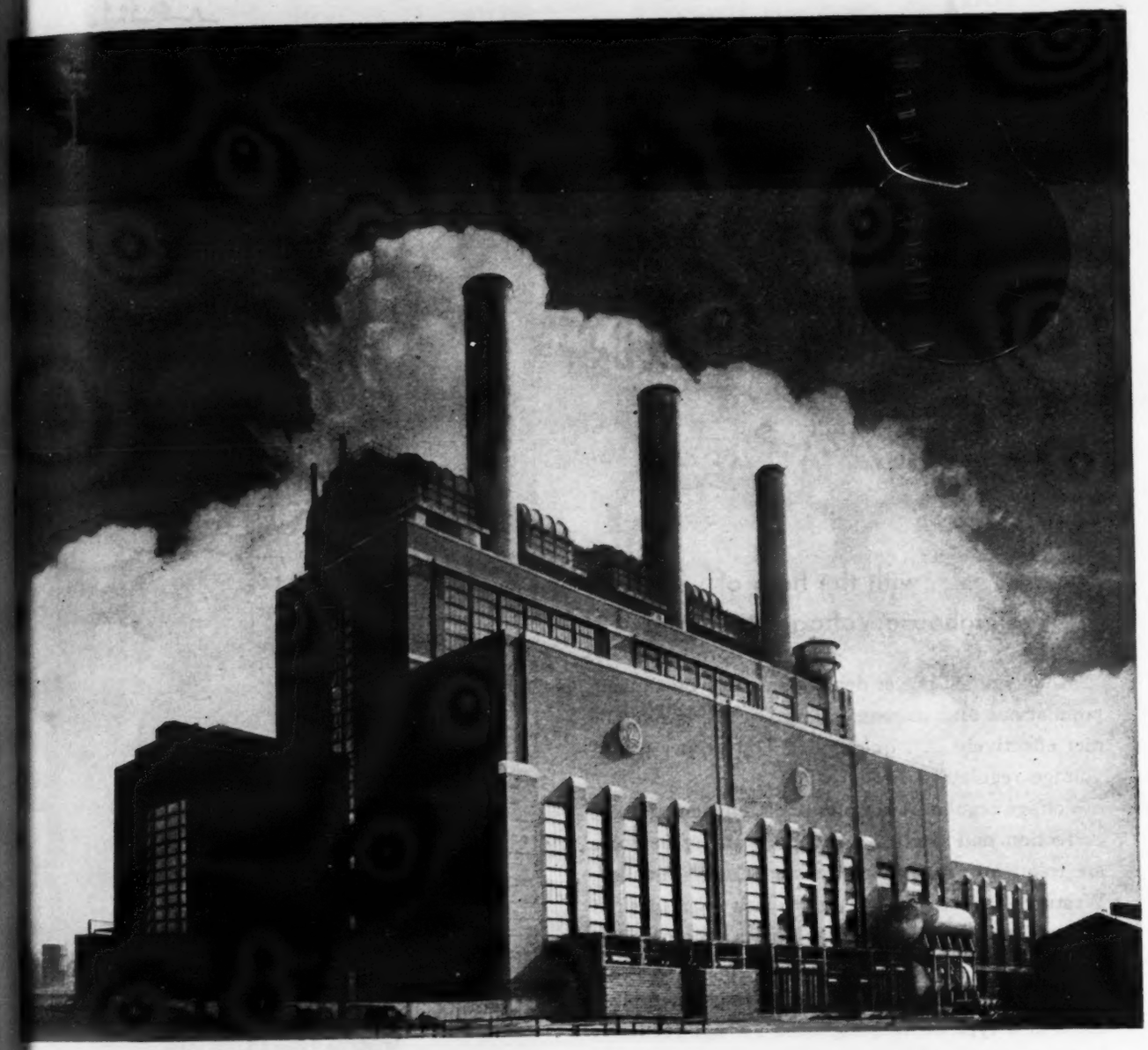
In New Jersey's critical war-plant areas, with their enormously increased load demands, power has never been "too little or too late." To the Electric Department of Public Service Electric and Gas Company belongs much credit for this distinguished war-time record. Its keen foresight and sound engineering in providing power-plant facilities capable of supplying war-urgent demands far beyond expectations are well illustrated by the performance of the Burlington and Marion Generating Stations.

In these two stations six Babcock & Wilcox Radiant boilers serve three 125,000-kw turbines, the first two boilers having been in service over 4½ years. Operating at their maximum guaranteed continuous rating most of the time, the load factor for the six boilers has averaged 81.6 per cent, and the availability factor 91.4 per cent, for a total of twenty boiler years.

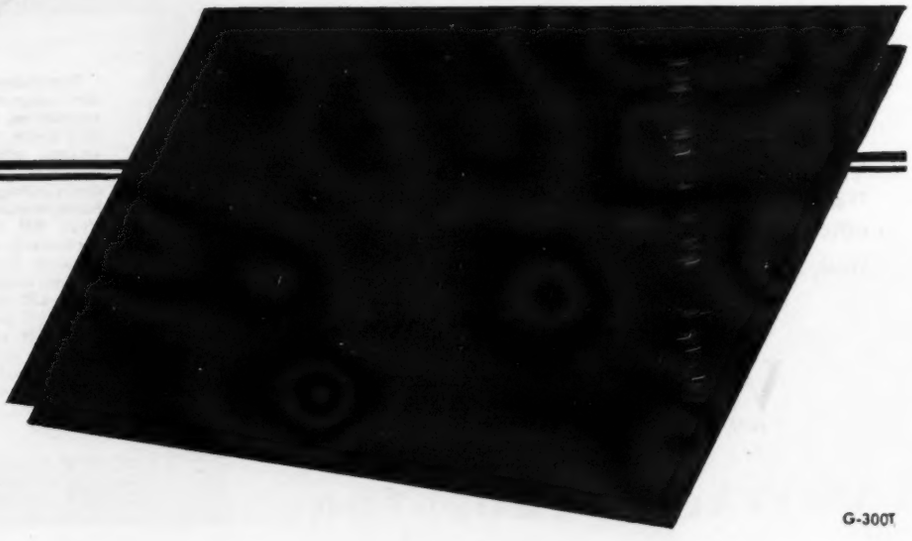
These boilers have never suffered a decrease in capacity caused by slag troubles, even though they have burned low ash-fusion coals from three states and *many* different mines—coals entirely different from the normal supply.

Public Service engineers knew—as do so many other power engineers—that with the selection of B&W steam-generating equipment, all the advantages are realized from over 60 years' specialized experience in designing, fabricating, and applying boilers and related equipment having a long record of highly satisfactory service.

Thinking and planning for tomorrow *today* is a job that B&W engineers are ready to tackle—in partnership with your engineers—at any time.



urlington Generating Station where four B&W
adiant Boilers are supplying over 2,000,000
ounds of steam per hour.



G-300T

faster conversion

TO CHANGING LOADS

. . . with the help of Westinghouse Voltage Regulators

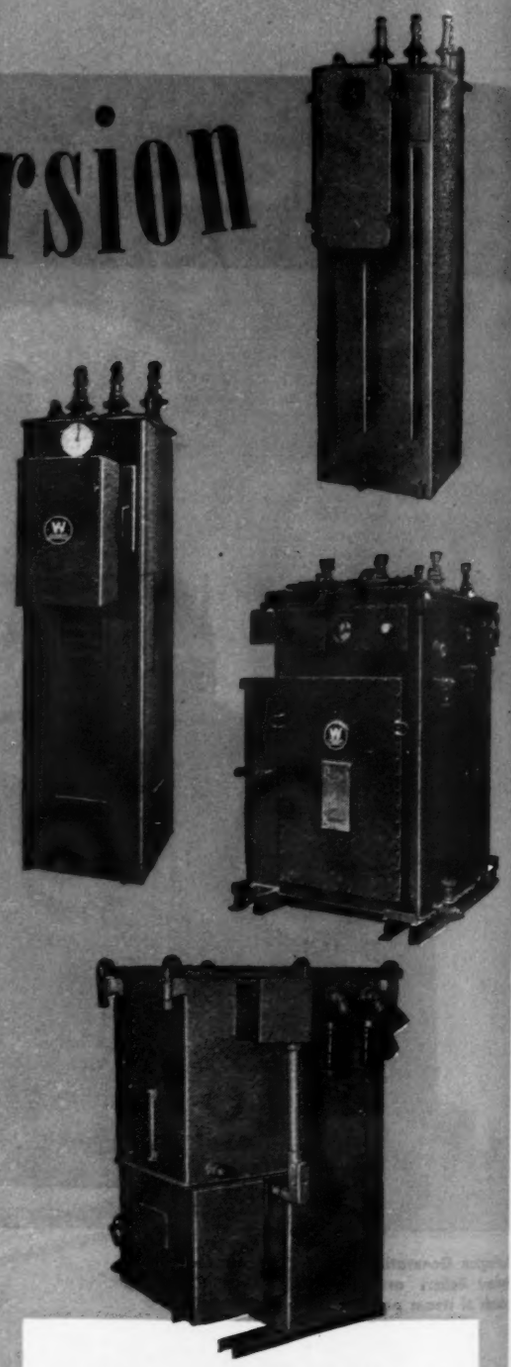
Many sudden power demands caused by shifting populations and increased domestic loads may be met effectively . . . quickly . . . by proper use of voltage regulators.

Voltage regulators supply quick, efficient voltage correction and control. New lines and generators are frequently made unnecessary. Easily installed, Westinghouse regulators give you the desired voltage correction with low losses. Simple and sturdy design prolongs life, reduces operating costs.

Whatever your power problem—large or small—there is a type of Westinghouse voltage regulator to fit your requirements . . . step-type regulators for power and transmission lines; liquid-cooled induction feeder type for outdoor and indoor use; air-cooled for indoor applications.

Before you consider altering present lines or generating capacity to meet expected load changes, explore the advantages of Westinghouse voltage regulators. Consult your nearest Westinghouse office, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-10268



Westinghouse regulators are built in a complete range of types and sizes for every power application. Top to bottom: Type SU induction feeder regulator for indoor or outdoor service, with exclusive "Sealedaire" construction; Type SA air-cooled induction feeder-voltage regulator for indoor use . . . flame-resisting insulation reduces fire hazard; Type BR feeder-voltage booster (2-step), particularly applicable for rural lines or distribution circuits where load changes once or twice daily from very light to full capacity; Type LR feeder voltage booster-regulator, four 2½% steps for rural distribution circuits; Type UR automatic step-voltage regulator for power and transmission circuits . . . can also be used to control phase-angle relation of 3-phase circuits.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

VOLTAGE REGULATORS

FROM THE COMPLETE LINE OF OLIVER POLE LINE MATERIALS

Oliver GUY CLAMPS

LIGHT TYPE

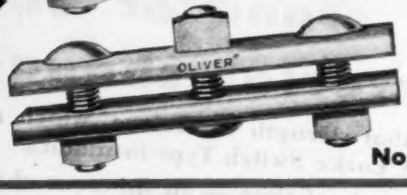
No. 8990

No. 9021

For 1/8 to 1/4 inch strands, Oliver Light type Guy Clamps are made in lengths up to 7 3/4 inches, with one to four bolts as required. Rigid manufacturing tolerances assure proper seating of guy strand, and maximum holding power.

MEDIUM TYPE

No. 9000

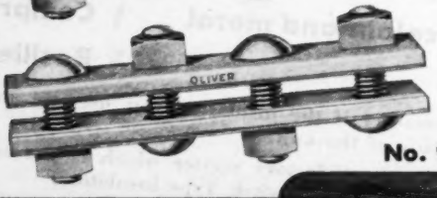


No. 9002

Used for strands up to 3/8 inch, Oliver Medium Guy Clamps are hot rolled from high quality steel, hot galvanized. High-strength, heat treated bolts have a shoulder to prevent turning when being tightened.

HEAVY TYPE

No. 9004



No. 9005

For strands up to 5/8 inch, Oliver Heavy type Guy Clamps use 2, 3 or 4 bolts, and are made in lengths up to 8 inches. The straight, smooth, parallel grooves of Oliver Guy Clamps provide greater clamping area and are not injurious to strands.

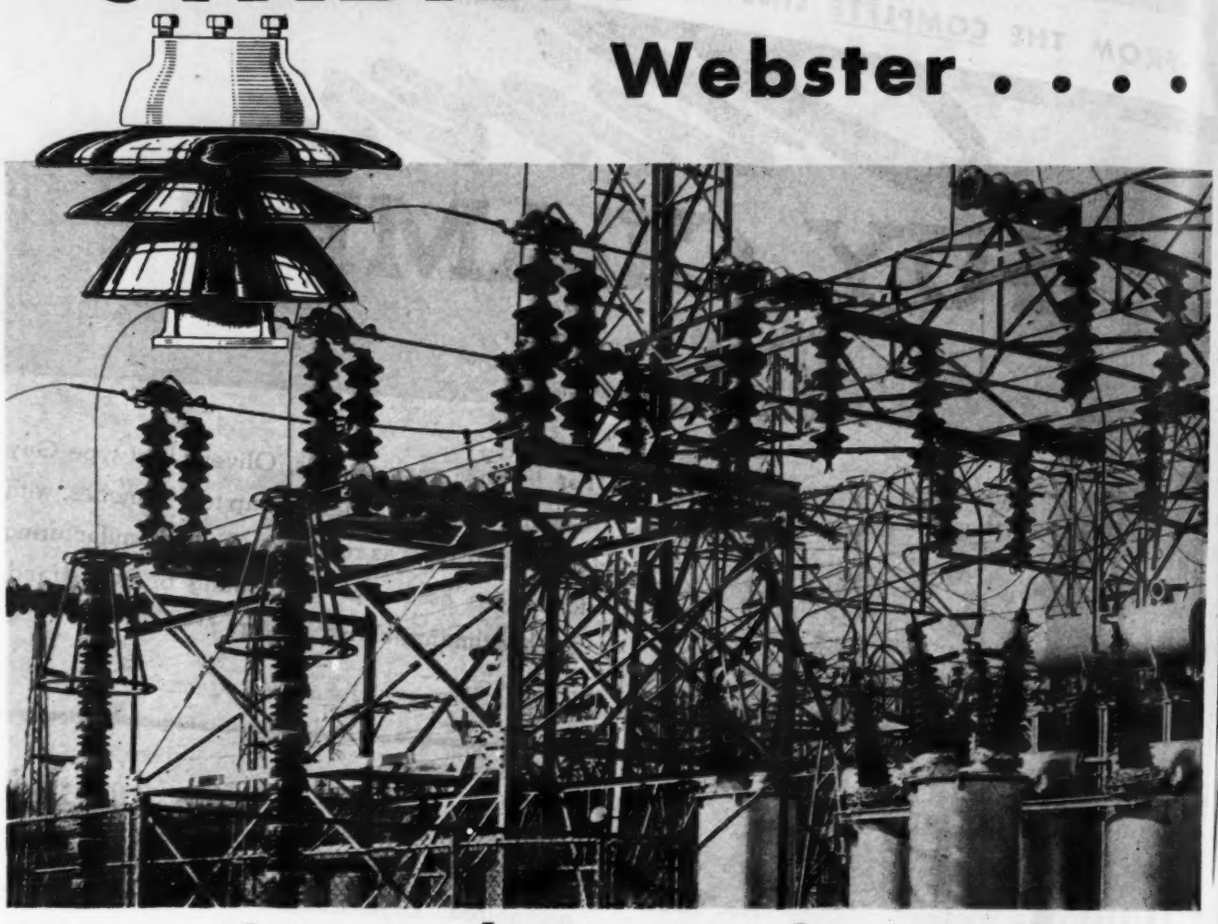
Write for the Oliver Catalog of Line Materials

OLIVER
IRON AND STEEL
CORPORATION

Makers of Pole Line Hardware since 1894

SOUTH TENTH AND MURIEL STREETS · PITTSBURGH 3, PENNSYLVANIA

"STABILITY" SAYS Webster . . . .



"strength to stand or endure without material change . . . ."

And it is that same stability, that strength to endure, which accounts for the 100% performance records of Locke Switch Type insulators.

Strength stability over long periods of time — an inherent characteristic of all Locke insulators—is not arrived at by accident. Nor is it the result of any single factor.

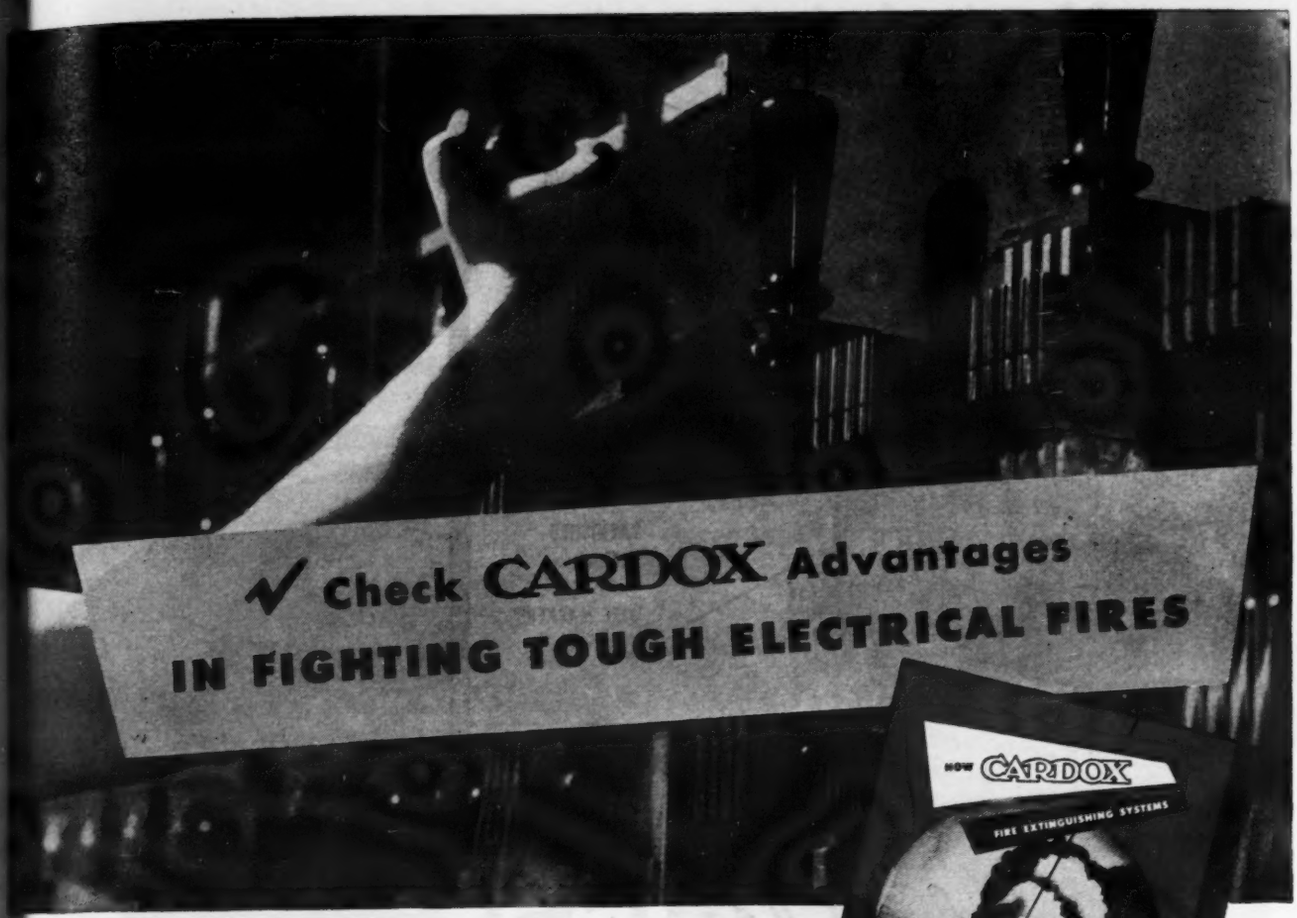
- **Composition of the porcelain**
- **Design, of both porcelain and metal**
- **Compression sand**
- **Compression surfaces**
- **Resilient assembly**

And other factors too, are necessary if the insulators you use are to maintain their high characteristics throughout the life of the unit.

You can be sure of the additional satisfactory service which is the end result of designed, built-in stability, when you specify Locke Switch Type insulators.

LOCKE *Insulator Corporation*

BALTIMORE · · MARYLAND



In ✓ Circuit Breakers, ✓ Bus Bays, ✓ Distribution Vaults, ✓ Motors, ✓ Generators, ✓ Switchrooms, ✓ Transformers, ✓ Turbines

By providing *pounds* or *tons* of non-damaging carbon dioxide as needed, Cardox Systems tame large or small electrical fires in a flash . . . keep electrical equipment in operation where too little . . . too late . . . could spell disaster!

The Cardox method of fire extinguishment through mass application of Cardox CO_2 is unique. It makes the immediate extinguishment of even very large fires by this fast acting, non-damaging medium practical . . . with reserve capacity for new emergencies after complete extinguishment has been accomplished. How the Cardox System enhances the fire extinguishing performance of carbon dioxide is a subject of prime practical importance to executives concerned with better protection against tough, hard-to-fight electrical fires.

Write today for Bulletin 565, describing actual step-by-step extinguishment of test transformer fire involving 3000 gal. of transil oil . . . and data on Cardox methods of control and engineered application that give carbon dioxide enhanced fire extinguishing characteristics.

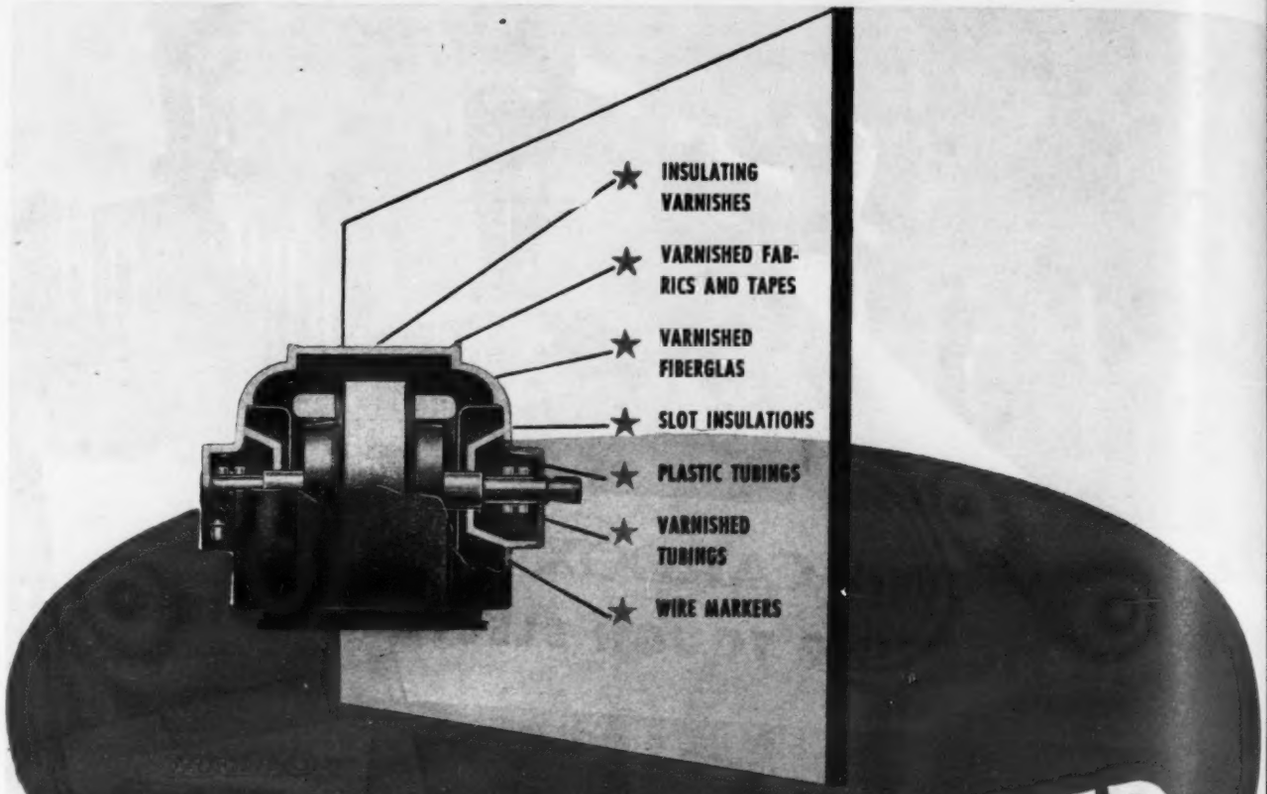
★ ★ ★

CARDOX CORPORATION
BELL BUILDING • CHICAGO 1, ILLINOIS

District Offices in New York • Washington
Detroit • Cleveland • Pittsburgh • San Diego
San Francisco • Los Angeles • Seattle

CARDOX
CO_2 FIRE EXTINGUISHING SYSTEMS

Cardox CO_2 is supplied instantly in pounds or tons from a single storage unit containing 500 pounds to 125 tons at controlled low temperature of 0°F and 300 p.s.i.



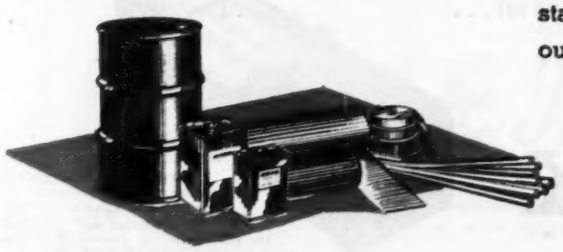
Completely INSULATED

by the Leader in Insulation!

Motor manufacturers have come to the realization that the specification "Completely Insulated by Irvington" means longer motor life with less chances of electrical failures. Basic to this is the fact that every Irvington insulation has been formulated to produce definite and outstanding characteristics — resistances to the agents of motor destruction — heat, corrosive fumes, excessive moisture etc. Insulations have been designed for regular and unusual motor needs — matched to work with each other for blended, smooth acting motor performance — to produce long-lasting and dependable motors. From this one source, *Irvington*, you can obtain insulations not only for motors but for all other electrical equipment as well. Each and every product is kept to Irvington's high standards by strict laboratory and production control. We offer our cooperation and invite your inquiries. Write Department 46

IRVINGTON PRODUCTS include:

Core Plate, Finishing and Sticking Varnishes • Varnished Canvas and Duck • Varnished Nylon, Rayon and Silk • Varnished Papers • Insulating Punchings • Fibron Plastic Tapes • Cardolite Compounds



IRVINGTON
VARNISH & INSULATOR COMPANY
Irvington 11, New Jersey, U. S. A.

Modern Decorative Lighting Effects with CORNING'S DIFFUSING "WAFFLE" PANEL

Here is a diffusing panel—available today—especially adaptable for architectural applications, where efficient illumination of large areas plus attractive and decorative appearance are important considerations.

This diffusing "Waffle" panel, available in 24" x 48" size, will accommodate up to four 40 watt or eight 20 watt fluorescent lamps. Multiple rows of incandescent lamps may also be mounted behind this panel to provide an exceptionally attractive appearance.

Pleasing and unusual effects can easily be obtained by varying the position of the lamps in relation to the panel. Harsh light is transformed into comfortable, glareless illumination and the desired balance in brightness contrasts is readily obtained.

Grooved construction permits the panel to be cut into sections in multiples of six inches, thus providing maximum flexibility in fixture and installation design.

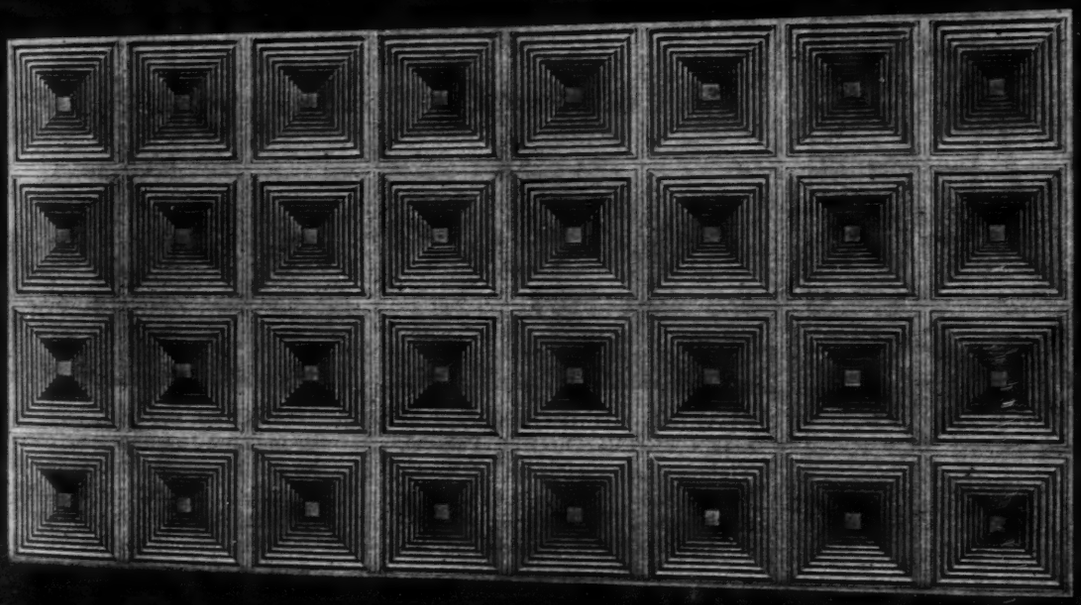
A copy of "Corning Lighting Data" will gladly be sent on request. It contains complete details on Corning's line of Flur-O-Guide lenses and diffusing panels. Write for your copy today. Lighting Sales Dept. EW-6, Corning Glass Works, Corning, N. Y.

Whatever Your Lighting Problems . . .
Specify Corning Engineered Lightingware

CORNING LENSES AND PANELS
Are Available for
GENERAL LIGHTING
SUPPLEMENTARY LIGHTING
LOCALIZED LIGHTING

For Special Effects in Commercial Interior Lighting
STORES SCHOOLS
THEATRES MUSEUMS
BANKS HOTELS
OFFICES HOSPITALS

Recommended for Industrial Plant Lighting, General Illumination and Localized Lighting
INDUSTRIAL PLANTS PRIVATE AND GENERAL OFFICES
ASSEMBLY LINES
INSPECTION AREAS ELECTRICAL
LABORATORIES INSTRUMENT
DRAFTING ROOMS PANEL BOARDS



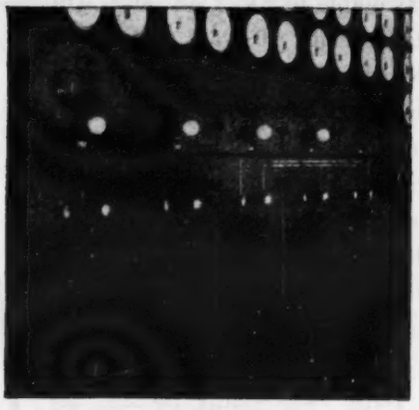
Note the grooved construction of the waffles which allows the panel to be cut in multipies of 6 inches.

"CORNING" is a registered trade-mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

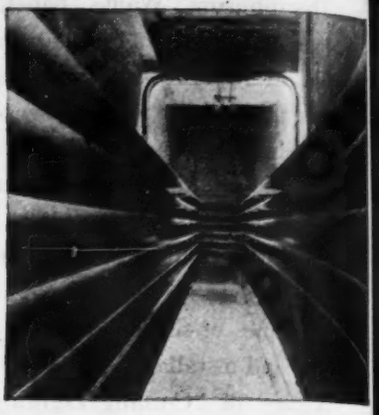
CORNING means Research in Glass

Corning Engineered Lightingware

Safeguard Future

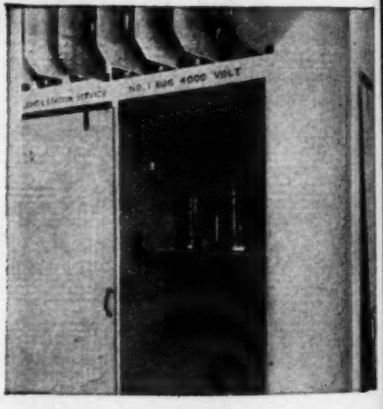


ASBESTOS EBONY is a permanent, inorganic mineral product. It won't rust, rot, shrink, crack or buckle. Impervious to water, gas, oil, and ordinary chemicals. Has high dielectric strength and insulation resistance.



TRANSITE CABLE TRAYS are made of an incombustible, strong, corrosion-resistant material. Designed to support cables. Transite Cable Trays save space, provide greater accessibility, cost less to install and need no maintenance.

SEALING COMPOUNDS. J-M makes several—Duxseal, Pakseal, Tranolseal and Uniseal, each one with special characteristics. All are easily workable at 35° F., with no slump at 300° F. They won't harden materially when exposed to air.



TRANCELL sheets are lightweight, strong, fire-resisting . . . excellent for cell structures, doors, and partitions. J-M Trancell conserves space, reduces floor loading, saves cost, since equipment can be bolted directly to it.

Construction...

PLAN TO USE THESE *Safer* ELECTRICAL MATERIALS

WHEN the green light "Go Ahead!" flashes for plant renewal and future expansion . . . *be ready to put these dependable Johns-Manville Electrical Materials to work for you.*

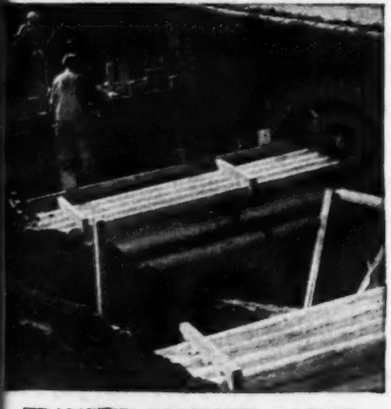
During the past critical years of sustained peak loads, J-M materials have helped engineers avoid waste and cut costs . . . by savings on installation expense, by reduced fuel consumption. And J-M Electrical Materials help further by providing an *extra* margin of safety!

Developed in the extensive Johns-Manville Research Laboratory, J-M-Electrical Materials are backed by the know-how acquired through 87 years of experience in solving construction problems.

* * *

All J-M Electrical Materials are described in Catalog GI-6A. For your copy, write: Johns-Manville, 22 E. 40th Street, New York 16, N. Y.

CABLE FIREPROOFING. Niagrite-Asbestoment, consisting of Niagrite, a commercially pure asbestos felted tape with or without reinforcement, and Asbestoment, an efficient refractory material, provides fireproof protection for cables.



TRANSITE CONDUIT and KOR-DUCT, made of asbestos fiber and cement, are fireproof, highly resistant to corrosion, electrolysis, and soil chemicals . . . are readily installed. Transite Conduit needs no concrete envelope underground.

Other Johns-Manville Products for the Electrical Industry

Chemstone
Electrobestos
Asbestos Tapes
Friction Tapes
Splicing Compounds
Transite Asbestos Sheets
High Temperature Insulation
Refractories
Transite Partitions
Acoustical Materials
Packings
Built-Up Roofing
Industrial Flooring
Transite Pressure Pipe

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville Electrical Materials

HIGH-ALTITUDE BRUSHES...

First aid for difficult ground-level applications

Many months have now passed since Stackpole brushes treated with a Westinghouse process first made aircraft generator brush life at high altitudes a matter of weeks and months instead of simply hours. During this time, much has been accomplished in adapting these same outstanding high-altitude brush principles to difficult and unusual ground-level applications.

The basic feature of these brushes is of course their amazing ability to maintain the essential protective film on commutators in order to minimize wear under a wide variety of commutating conditions. Although Stackpole research in applying this feature to brushes for earth-surface equipment is still continuing, it has now reached a point where Stackpole engineers will welcome inquiries from brush users having unusually difficult conditions to meet. You can count on a frank and honest opinion as to whether or not we believe Stackpole High-Altitude Brushes can help you.

STACKPOLE CARBON CO., St. Marys, Pa.

STACKPOLE

THE NATION'S LARGEST PRODUCER OF FRACTIONAL HORSEPOWER MOTOR BRUSHES

Brushes and Contacts (All carbon, graphite, metal and composition types.)
Rare Metal Contacts • Graphite Bearings • Welding Carbon Products
Packing, Piston and Seal Rings • Continuously Adjustable Carbon Rheostats
Sintered Iron Components

JUST A COUPLE PIECES OF WIRE

Yes, just two samples of wire, but what a difference! The barbed fence wire soon becomes ragged with rust that grows progressively worse. The other wire is a heating unit made of Chromel, the first nickel-chromium resistor alloy. This wire will "rûst", too, but in a way totally different from iron. Chromel's rust is thin and dense, and clings tenaciously to the wire. It acts as a protective coating against progressive oxidation. And thus, Chromel units don't wear out until they have given outstandingly long service. For full details ask for Catalog M.

RESISTIVITY @ 68°F

	WIRE (C. M. Ft.)	RIBBON (Sq. M. Ft.)
Chromel-A	650 Ohms	510 Ohms
Chromel-C	675 Ohms	530 Ohms
Chromel-D	600 Ohms	471 Ohms
Copel	294 Ohms	231 Ohms

Chromel* NICKEL CHROMIUM
HOSKINS CHROMEL ELECTRICAL HEATING ELEMENT WIRE

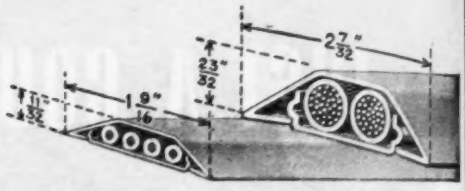
*Used as the Heating Element in Millions of Devices.

HOSKINS MANUFACTURING COMPANY, DETROIT 8, MICHIGAN

"We'll have to move this department to the floor above"

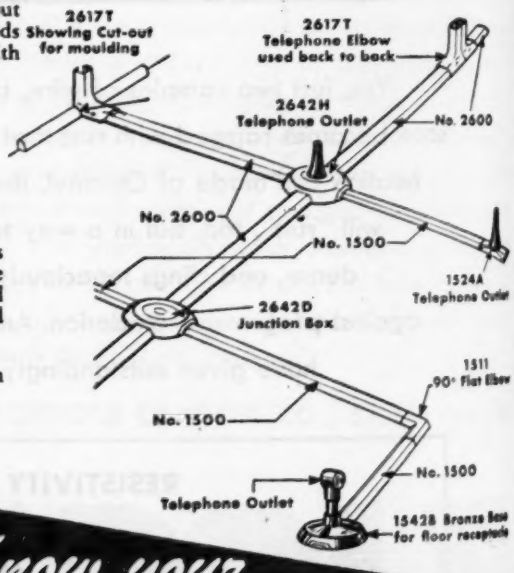
When this happens . . . as it does every day in busy office buildings . . . will there be costly delays and confusion in re-connecting telephone, communications, and light and power services to desks? Not if you install "Pancake" . . . the Wiremold Overfloor Wiring Systems designed for just this purpose.

PANCAKE SOLVES THE WIRING PROBLEM



PANCAKE

"Pancake" Overfloor Wiring Systems . . . "flat as a pancake; strong as a bridge" . . . are available in two sizes, No. 1500 with a capacity of 4 No. 12 and No. 2600 with a capacity of 2 26-pair telephone cables. Together, these two sizes of raceway and their fittings permit complete, efficient, and speedy layout of wiring for all telephone or power and light service needs in offices. Later additions, extensions, changes are made with time- and cost-saving facility.



AND HERE IS HOW IT IS DONE

1524 Telephone Outlet

Base of "Pancake" Raceways provided with screw knockouts for easy installation. Slip-joint connections to fittings insure electrical bonding. Wiring is laid in and cover sections snapped on to complete installation. Raceways and Fittings are designed to meet telephone company requirements.

Write us today for bulletins describing installation and use in detail. The Wiremold Company, Hartford 10, Conn.

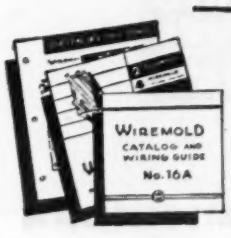
1542B Receptacle Base

1542D Junction Box

2642D Junction Box

2642H Telephone Outlet

2617T Telephone Elbow



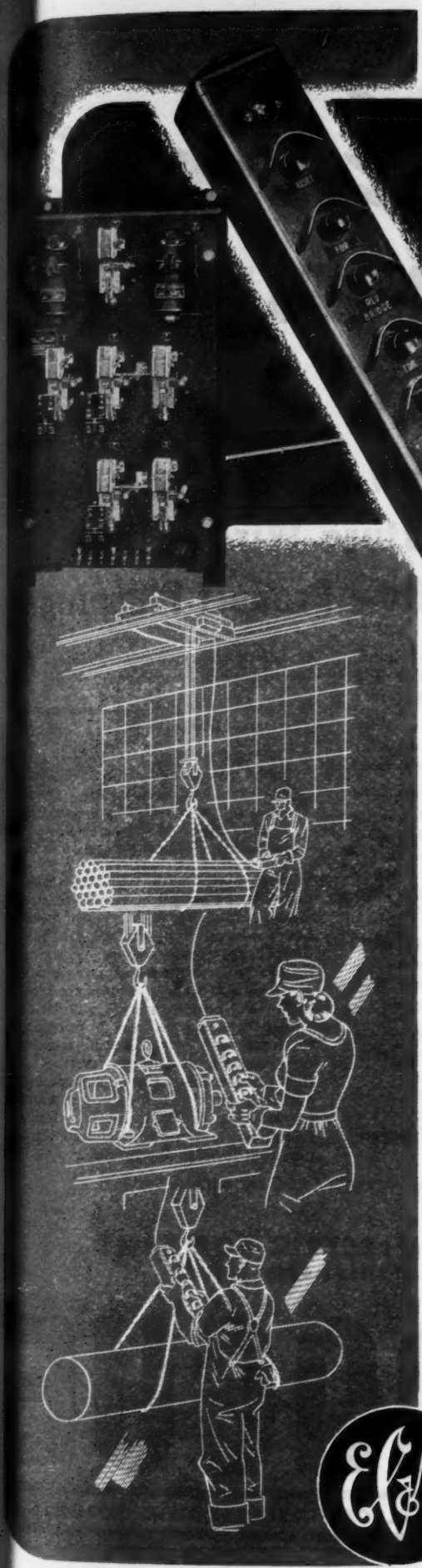
PRODUCTION EXECUTIVES

There are many unusual ways in which Wiremold can help you save motions, speed production and assembly through efficient "wiring for work". Write us for Wiring Guide, industrial bulletins and data sheets.

Know your WIREMOLD

NEMA

BUSINESS BUILDER IN TOMORROW'S MARKET FOR ADEQUATE WIRING



A COMPLETE NEW LINE OF *Push Button* CONTROL

for D-C FLOOR OPERATED CRANES

Compact—Easy to mount—Easy to wire
Provides Accurate Speed Regulation

THIS EC&M standardized line of controllers is designed for (1) accurate inching, (2) compact mounting, and (3) minimum collector-bar requirements. They can be conveniently installed along the crane girders or mounted on the trolley, as required.

They have all the advantages of the well-known EC&M Control for *cab-operated* cranes. Acceleration is by the TIME-CURRENT method. Contactors are of the heavy-duty, magnetic type. Resistors are carefully proportioned for low-torque hoisting of light loads and for smooth acceleration of bridge or trolley. All motions can be controlled from a single, pendant, master-station complete with Pilot Light, Reset Button, and Emergency Stop, Double Pole control-circuit, Toggle Switch with two Push Buttons for each motion. Individual rope-operated Master Switches for the various motions are optional.

Bulletin 922 gives complete data, description, dimensions, etc. Send for your copy today.

THE ELECTRIC CONTROLLER AND MANUFACTURING CO.
2698 East 79th Street **Cleveland 4, Ohio**

Exclusively

FOR ENGINEERS WHO ARE LOOKING AHEAD!

Where and How Might this Class C High-Temperature Wire Insulation Fit into Your New Product Planning?

Sprague *CEROC 200 is an inorganic wire insulation having outstanding space factor and high-temperature advantages:

- *Applied to copper, nickel, or other types of wire, it permits continuous operation at 200°C.*
- *Wound in coils, the thermal conductivity of *CEROC insulated wire is such that it does not develop hot spots to a point of nullifying much of the high-temperature gain which might otherwise be expected.*
- **CEROC 200 has an exceptionally high space factor as the ceramic coating is only one quarter of a mil thick and is uniform for all wire sizes.*
- *Substantial volt-ampere rating increases can be obtained.*
- *Thimble-size coils can be wound to do spool-size coil jobs.*
- *Throughout the entire field of insulated wire wound electrical devices, countless opportunities exist for re-designing and re-rating products for greater efficiency in smaller sizes and at higher temperature operation.*

Sprague *CEROC 200 is by no means a new or untried development. Pioneered and perfected by Sprague several years ago, it has been supplied exclusively and in large quantities for war applications. Its *proved* advantages are these:

Wire insulated with *CEROC 200 can normally be supplied in sizes to meet almost any coil, transformer, or motor need. Although practically 100% of the present greatly expanded production is still going for war uses, samples of several popular sizes are available in "engineering" quantities. These represent a real opportunity to those who recognize the tremendous design advantages inherent in this unique insulation development, and who seek to test it, not so much for existing products but in relation to entirely new or re-designed products that look to the future.

*Write today for copy of *CEROC 200 Bulletin 505*

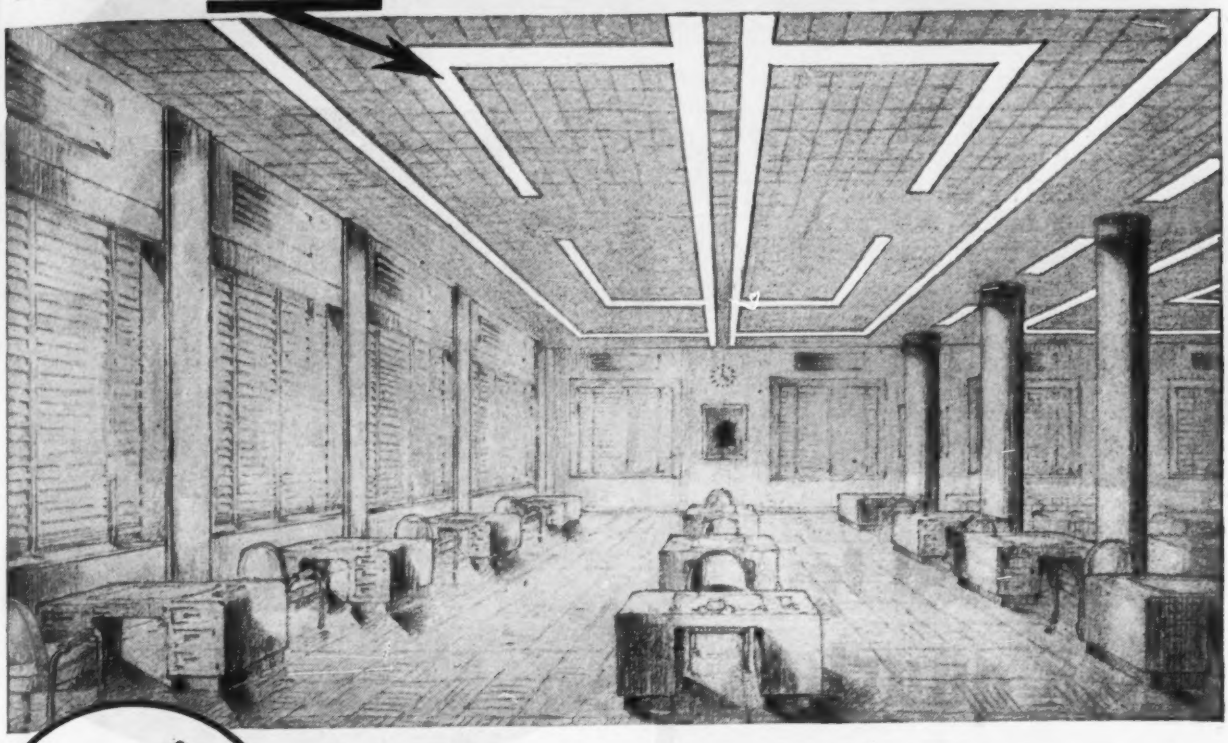
SPRAGUE ELECTRIC COMPANY
NORTH ADAMS, MASSACHUSETTS

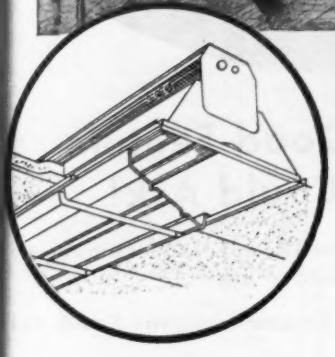
SPRAGUE

PIONEERS IN ELECTRIC-ELECTRONIC PROGRESS

*Trademark Reg. U. S. Pat. Office

Follow *These* Lines of Least Resistance





Miller Fluorescent Troffer Lighting Systems

for offices, stores, factories, schools and public buildings

AID IN PLANNING
SIMPLIFY CONSTRUCTION
FACILITATE MAINTENANCE

They aid in planning because they suggest practicable new themes for interiors.

In geometric patterns or lightstrips "by the mile" . . . in a versatile variety of glass and plastic lenses, plates, and metal or plastic grilles . . . they encourage the modern trend to plan the *entire building* around the lighting.

They simplify construction because of mature, forward-looking engineering that solves past problems—without adding new ones.

For instance: The Miller patented bracket ends laborious fitting of recessed lighting systems into hung ceilings. Now, these brackets are hung from the structural ceiling and support both furred ceiling and Troffer Lighting System!

The true cost of any lighting system is the *complete* cost, installed and operating.

Miller Fluorescent Troffer Lighting Systems facilitate maintenance because they are engineered to assure *continuing* economies of operation.

Yes, from first to last, Miller Fluorescent Troffer Lighting Systems are an outstanding achievement of our times!

Miller field engineers are conveniently located to serve you.

Other Pluses of MILLER Fluorescent Troffer Lighting Systems:

Supports from structural ceiling reduced 50 to 75%.

•

Conduit and conduit fitting costs reduced up to 80%.

•

Wiring costs reduced up to 50%.

•

Permanent operation and maintenance economies.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

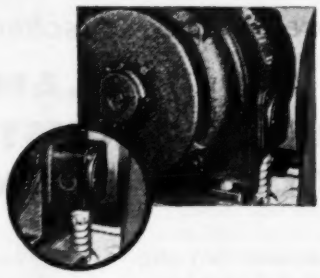
OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

Designed for close quarters



An innovation of the Fairbanks-Morse general-purpose motor is the recessed conduit box for neat installations where space is at a premium.

The leads can be brought in between the feet of the motor through a tapped hole in the motor frame, and the conduit box cover mounted flush with the frame. Neat installations are simple because of this feature. A conventional conduit box is provided, and may be used if desired.

The recessed conduit box is another of many features which make this the motor best suited to your use. To appreciate it fully, see a demonstration. Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Ill.

Every Good Feature You Could Ask!

Copperspun Rotor—The *only* rotor centrifugally cast in one piece—and of *copper.*

Protected Frame—Excludes dripping liquids and falling particles.

Cross-flow Ventilation—Another exclusive feature. Air moves in both directions, providing uniform cooling—no hot spots.

Ball Bearings—Sealed in and protected.

Adaptability—Frame gives protection in any mounting position because the vented bearing brackets can be turned to four positions 90° apart. Reversible frame permits locating conduit box on either side.

Balanced Characteristics—A 40° C. motor with high efficiency and power factor, and excellent starting and accelerating torques.

BUY WAR BONDS TO BACK THE FRONT

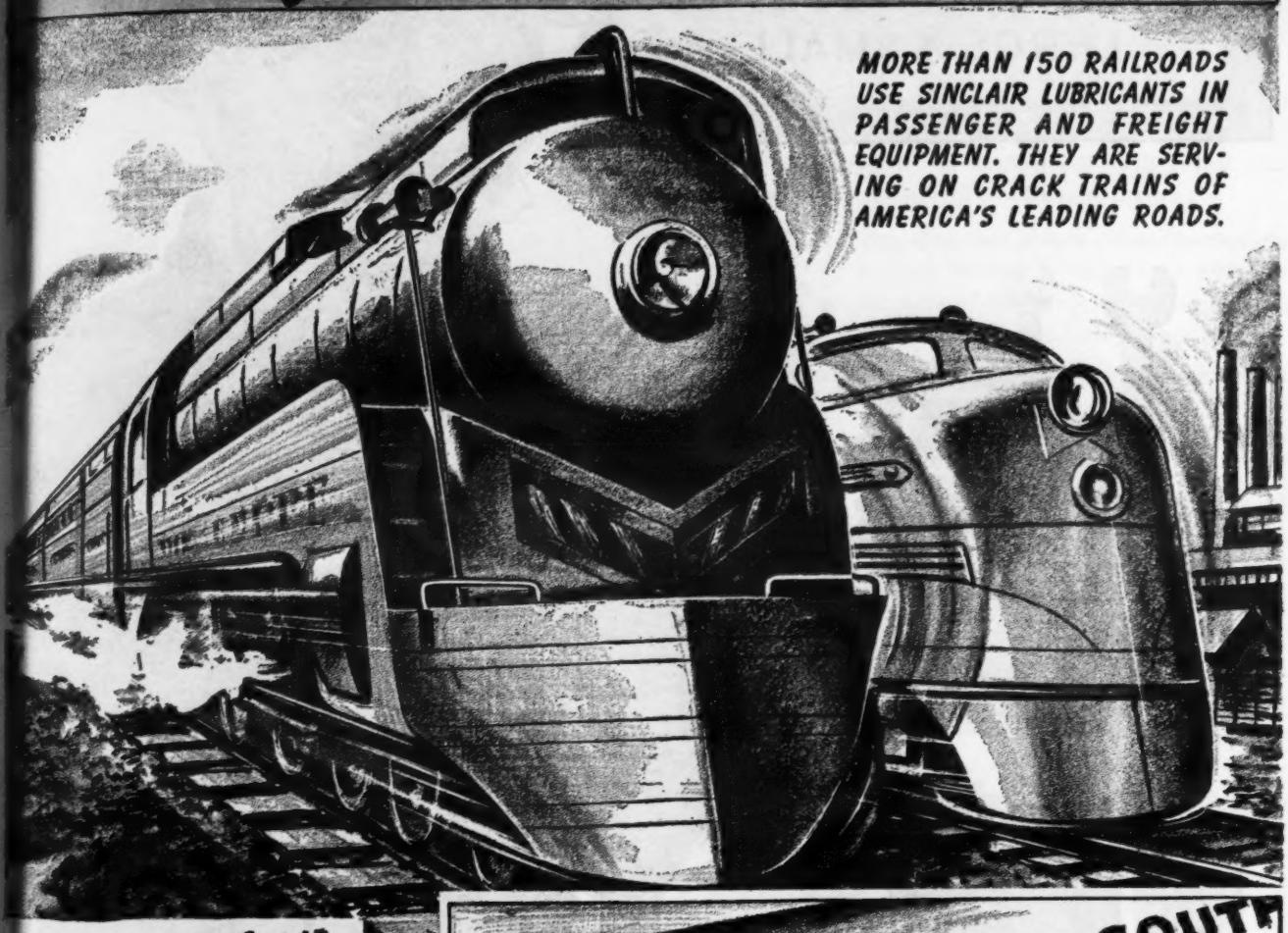
Fairbanks-Morse

A name worth remembering

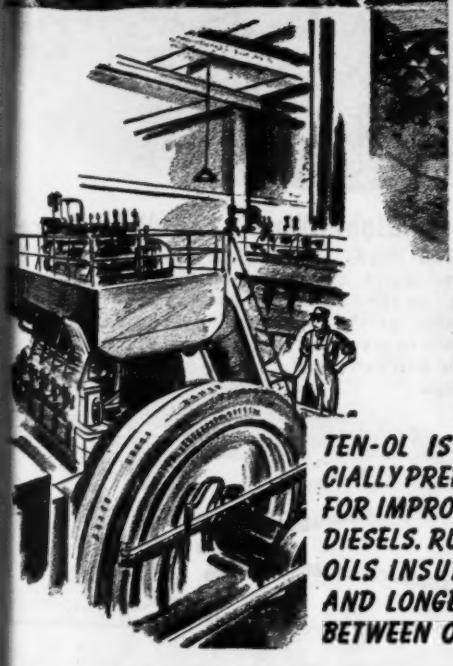
Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps • Scales
Magnetos • Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

APR 23 1947
APR 8 1947

Do you know that . . .



MORE THAN 150 RAILROADS USE SINCLAIR LUBRICANTS IN PASSENGER AND FREIGHT EQUIPMENT. THEY ARE SERVING ON CRACK TRAINS OF AMERICA'S LEADING ROADS.



TEN-OL IS ONE OF THE SPECIALLY PREPARED SINCLAIR OILS FOR IMPROVED LUBRICATION OF DIESELS. RUBILENE AND GASCON OILS INSURE CLEAN ENGINES AND LONGER SERVICE PERIODS BETWEEN OVERHAULS.

CHICAGO AND SOUTHERN AIR LINES WHICH HAS INAUGURATED AN ADDITIONAL DETROIT-HOUSTON-NEW ORLEANS DAILY SERVICE WITH NINE INTER-CITY SCHEDULED STOPS HAS FLOWN ITS FLEET OF DIXIELINERS MORE THAN 18,600,000 REVENUE MILES ON SINCLAIR PENNSYLVANIA MOTOR OIL.

SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

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IT TAKES one kind of "know how" to build ships . . . it takes another kind to repair them! Commercial Iron Works has both. Since 1916 CIW has been building and repairing tugs, river boats, flat-tops, landing craft, mine sweepers, yes, and even dredges. During these 29 years Commercial Iron Works has been the leading ship repair firm in this port. CIW's reputation for "know how" in both shipbuilding and ship repair has become a legend on the Pacific Coast. Little wonder then that with the advent of war both the United States and the British Navies commissioned Commercial Iron Works to build, convert and repair ships for their navies. To their already vast engineering and construction experience CIW added the "know how" of installing radar, air conditioning equipment, refrigeration units, pumps and intricate diesel installations to the rigid requirements of the world's two greatest navies. Today every iota of CIW's famed "know how" is being utilized to bring the war in the Pacific to a speedy conclusion. In the postwar tomorrows to come this same "know how" will be at your disposal for ship repair, conversion and new ship construction.

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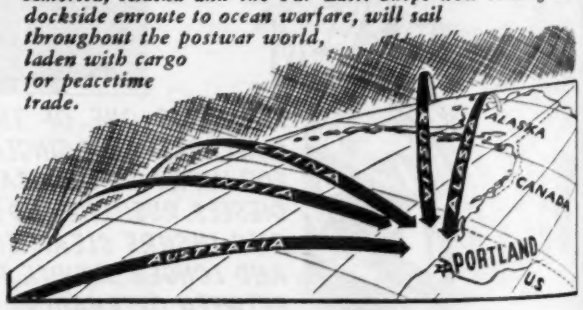
Commercial Iron Works is strategically located to serve by rail, truck and water the Pacific Northwest's vast inland empire, as well as the incalculable postwar markets of South America, Alaska and the Far East. Ships now leaving CIW dockside enroute to ocean warfare, will sail throughout the postwar world, laden with cargo for peacetime trade.



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IN 1/5 THE TIME WITH THE *Hydro-Volifier*

● More and more companies are conducting operating tests to determine the merits of the Hydro-Volifier as compared with other oil-processing means. We welcome them.

Test after test proves definitely that the Hydro-Volifier is the most effective method of cleaning, dehydrating, degasifying and stabilizing insulating oil.

FOR EXAMPLE:

Comparison of Conventional Filter Press and HYDRO-VOLIFIER

●

Transformer Oil test conducted at prominent Chemical plant

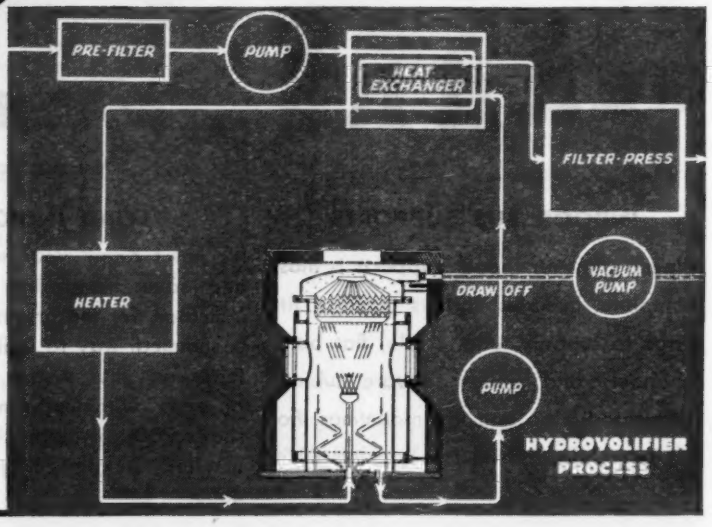
●

Condition of oil at start . . . . . 15 KV–
Condition of oil serviced AFTER 16 HRS. with Filter Press . . SATISFACTORY
Condition of oil serviced AFTER 3 HRS. with Hydro-Volifier . . 30 KV+

FILTER PRESS		HYDRO-VOLIFIER	
Power—16 hours	$ .18	3 hours	$ .63
Filter Paper—1 ream	5.00	28 sheets	.28
Labor—16 hours	24.00	3 hours	4.50
Total	$29.18	Total	$ 5.41

Estimated power cost @ .1½ per KWH, Labor $1.50 per hour. In making this test a 100 gallon per hour capacity Hydro-Volifier was connected to a G. E. transformer holding 320 gallons of oil which had not been serviced in 3 years. The results speak for themselves.

In the flow chart below—oil passes from prefilter to pump—to heat exchanger—to heater—to spray chamber—to pump—to heat exchanger—to filter press—back to transformer.



AVAILABLE

in three standard sizes

HV—100—Capacity 100 gallons per hour
HV—300—Capacity 200 gallons per hour
HV—300—Capacity 300 gallons per hour

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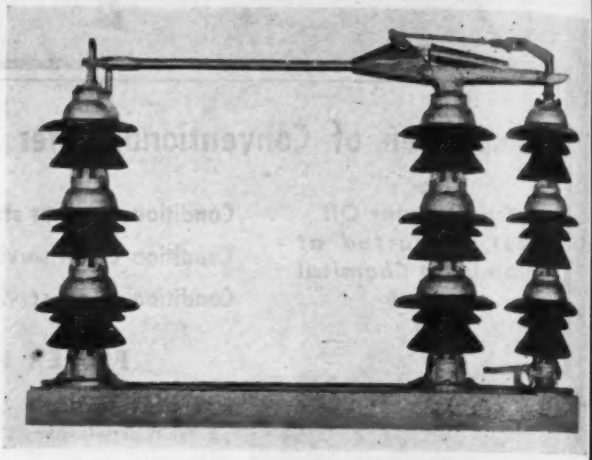
SELECTED MATERIALS...

TO BUILD DEPENDABLE SWITCHGEAR requires experience, tested materials, and "Know-How." Elpeco's entire line of Indoor and Outdoor switchgear and devices incorporates all three.

In serving the Electrical Industry for 30 years, Elpeco has distributed its long line of products in every state and many parts of the world. Electrical Engineers specify Elpeco because of quality and service the product gives.

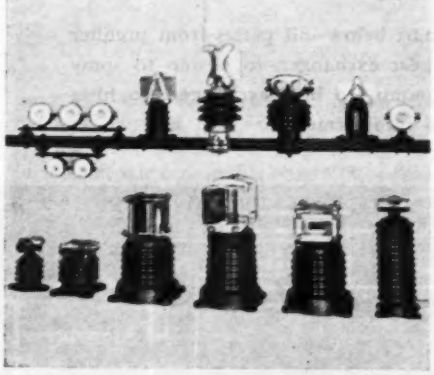
Elpeco's intent is to continue producing quality switchgear incorporating modern design, tested materials, and superior workmanship . . . three "musts" that utilities list as important in constructing *better* switchgear.

On these pages are shown just a few of Elpeco's products. They are available now, and you will profit by installing them as soon as possible. Look over the line . . . write today for details of construction. Many special types available.



TYPE 190 SWITCH
For High Voltage—High Pressure Contacts

This is a 1940 development incorporating high pressure contacts at *both* hinge and contact points. Contact releases before the blade opens. The blade contact is of the "lobster claw grip," a unique form of high pressure contact that grips tightly and securely. Bearings are of the roller greaseless type. Write for Booklet 4100.



INDOOR BUS SUPPORTS

Elpeco's line of indoor supports is most complete. Includes various types of fittings to support tube, cable, flat bars, channels and hollow square tubing. Illustrated: Pipe and flat mountings. For complete data write for Booklets 6100 and 6200.

LOAD INDICATOR

It's new! *Know* your transformer load and save transformer capacity. This indicator, for the first time, provides an economical way to indicate and record loads on your system. Readings, start at zero with uniform load applied, shows 90% of its maximum load in 30 minutes. Details contained in Booklet 4600.

ROTA SWITCH
(open position shown)

You see when it's open, you see when it's closed . . . that's the advantage of the glass panel in both front and back of this switch. A safety feature if there ever was one! Can also be furnished with cable terminator. Made from 5 to 15 K.V—from 200 to 2,000 ampere capacity. For complete data write for Booklet 6300.

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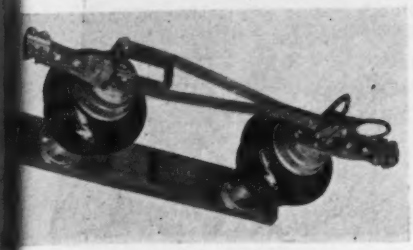
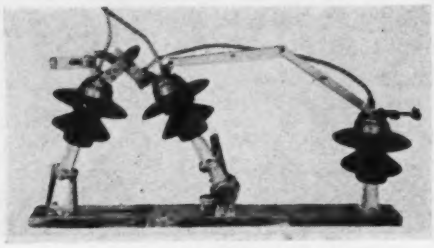
FINE WORKMANSHIP

_that's Elpeco!



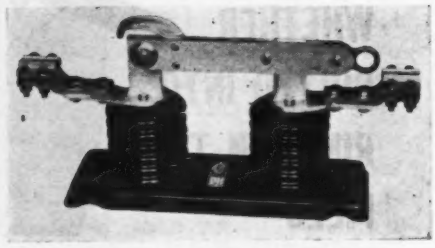
SINGLE POLE OUTDOOR HOOK STICK

Made in various types: double throw, single throw, tandem transfer and tandem regulator. Contact silvered, all live parts above insulators are nonferrous. Fly-out feature of lock helps to open the switch. Details in Booklet 4000.



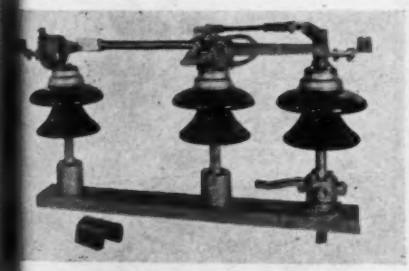
TYPE S-3

A tilting insulator type of Load Break switch. Three insulator construction, silvered contacts. A simple type of disconnecting switch backed by years of service. Write for Booklet 3300.



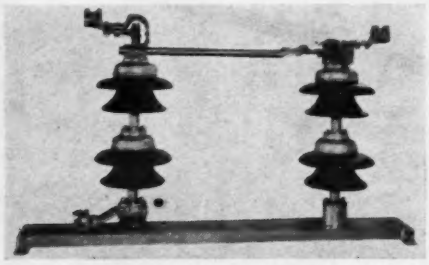
ELPECO INDOOR SWITCH

Made to meet various operating conditions. Are of double-blade construction, the blades straddling the hinges and contact clips. Silvered contacts. Write for Booklet 6300.



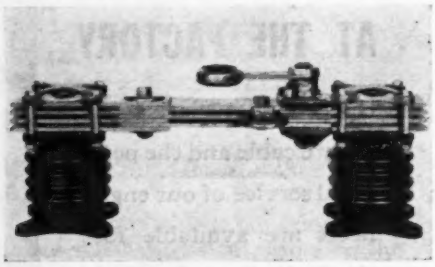
TYPE WS SWITCH

Incorporates the modern demand where the blade is withdrawn from clip before switch opens. This reduces strain on insulators operating under severe weather conditions. Silvered contacts. Write for Booklet 3900.



TYPE TS-I SWITCH

Moderate priced side break single rotating insulator form of switch adaptable to many types of simple switching and distribution circuits. Silvered contacts. Details in Booklet 3700.



BUS SECTIONALIZING SWITCH

Available in both hinged and removable blade. For Bus installations this type of switch makes ideal construction. The removable blade type guarantees workers' safety.

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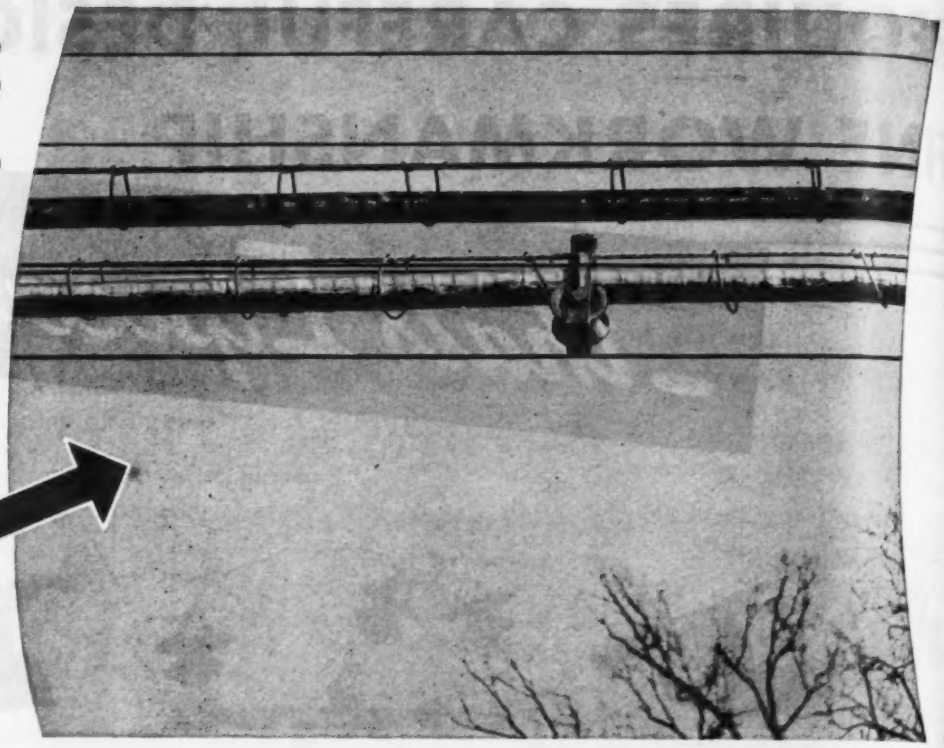
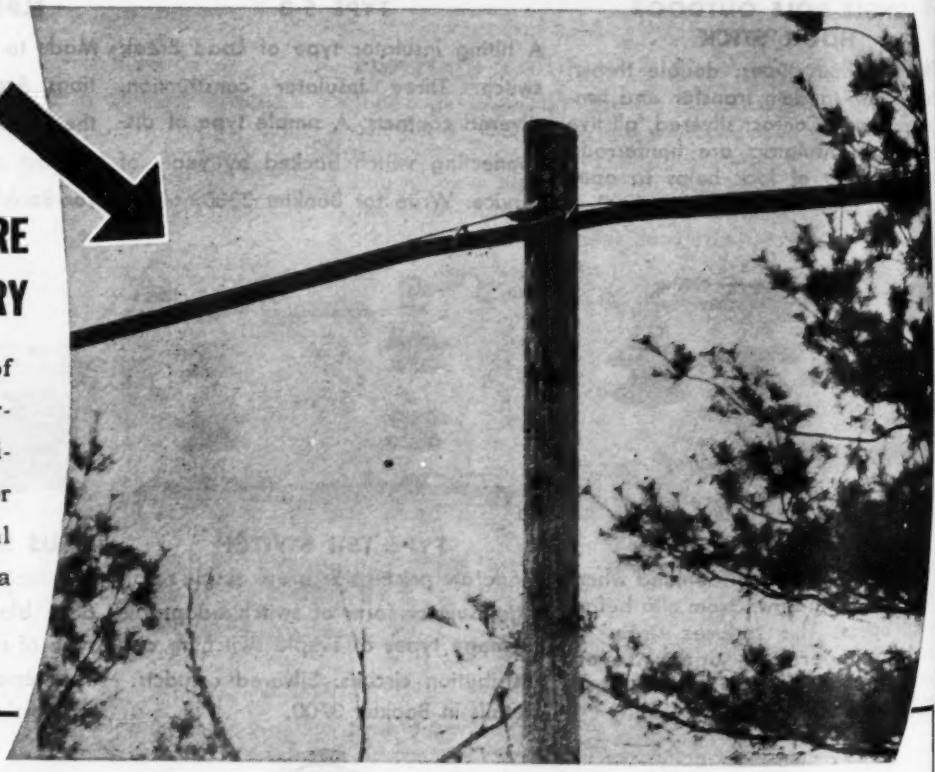


WHETHER PULLED INTO RINGS IN THE FIELD

OR

INCORPORATED WITH THE MESSENGER WIRE AT THE FACTORY



the characteristics of Kerite cable and the personal service of our engineers are available for the solution of aerial cable problems over a wide voltage range.

THE KERITE INSULATED WIRE & CABLE COMPANY INC

NEW YORK CHICAGO SAN FRANCISCO

RUSSIA AND AMERICA

ALLIES—or else . . .

VICTORY in Europe was won only through the combined endeavor of the United Nations. Only through sustained joint effort can the fruits of that victory be reaped.

Without disparaging the truly heroic contributions of others, three of the Allies may fairly be credited with having made the major contributions to victory over the European Axis—the United Kingdom, Russia, and the United States. The close accord of these three nations is no less crucial to the accomplishment of the tasks that remain.

First of these is the war against Japan. It still requires winning. Even without any help from others, the United States could make good this victory, but the war's duration will be speeded by the marshaled effort of the United Nations.

Next, and not less important, is the task of establishing a basis for enduring peace. In this struggle our enemies are more formidable than any we have faced—national ambitions, prejudices, suspicions and distrusts, the staggering burden of tradition and debilitating cynicism born of past failure, the cleaving wedges of divergent languages, thought patterns, economic creeds and procedures—an array of difficulties as baffling as fog and as formidable as a deluge. They can be vanquished only by a continuance of the working accord between the United States, Russia, and Britain that was forged on the anvil of European conflict.

☆ ☆ ☆

This high appraisal of the decisive importance of the Big Three in determining the destiny of the United Nations organization, in no way depreciates the importance of the role to be played by France, by China, or the other freedom-seeking nations represented at San Francisco. All of us are committed to the building of a genuinely representative security organization in the conviction that by such means alone can we possibly achieve a just and lasting peace. But the strength of any international machinery will depend upon the validity of Russian-British-American cooperation. If these three are able to achieve substantial harmony of aim and procedure, a world organization that includes them can operate with effective coherence. If they pull apart, the United Nations will break up into competing and jealously hostile blocs.

This is inevitable because of the sheer weight of these three nations in the world's affairs. Between them they account for perhaps half of the world's income and from two-thirds to three-quarters of its industrial output. Once Japan has been crushed, they will control an overwhelming preponderance of the world's armed might. Each of them will wield military power on a scale quite beyond the power of any embryo security league to hold in check. Only if all three are resolved to keep the peace and to enforce it through the Security Council, can that body hope to accomplish its aim.

Although there is a tendency on both sides of the Atlantic to indulge somewhat recklessly in mutual criticism, the ties between Britain and America are too firm to be severed by any foreseeable strain. But that has not been true of our relations with Russia. Even while fighting a war in which our respective ways-of-life were at stake, the inestimable services of each to the other were rendered as friendly but independent associates rather than as fully trusted partners. Now again, as we approach the difficult and vitally important task of building a world organization and of devising a European peace, the task of our delegates is complicated by national attitudes under which each hopes for the best from the other, while fearing the worst.

But the stakes for us both—and for the rest of the world—are too high to be played for in a diplomatic poker game. Russia has no inhibitions in demanding what she wants, and our own vital interests must be stated and upheld with undeviating firmness. Yet we both must face the stark fact that few advantages that either nation might gain at the cost of dissipating the good will of our wartime association could be worth the price thus paid.

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The first steps toward establishing confidence lie in a frank recognition of what may contribute to the lack of it and in a definition of what can be done to restore it.

1. *Probably the greatest single area of reciprocal distrust between Russia and our own country is based on the fear of each that the other may try to interfere with its domestic, economic, and political affairs.* Each purports to see the beam of meddlesome intervention in the other's eye, while it ignores the mote in its own. Thus the Soviet Union remembers that we participated in the foreign military intervention at the time of her civil revolution, and afterwards lent our support to successive boycotts of her trade, of her gold, and of her credit needs. For our part, we remember the Soviet Union's doctrine, and

aggressive support, of revolutionary international communism.

We feel that Russia should find satisfactory evidence of our present willingness to have her develop her internal institutions as she will in the aid that we have given her during the war, and in the record of our good-neighbor policy as applied to Latin America. She, no doubt, resents our lingering suspicions in the face of her declared policy of 1941 to refrain from any attempt to influence the political or economic structure of foreign nations. Certainly, each of us will need the repeated reassurance that can come only through sustained performance by the other in the years ahead. Meanwhile, much will be gained if each will give to the other's good faith the benefit of the doubt, while it scrupulously guards its own conduct to avoid even the appearance of backsliding.

2. *A second zone of suspicion is created by those measures which each of us interprets as natural and necessary bulwarks of national security when they are our own, but as evidence of dangerously aggressive imperialism when taken by the other.* In our view, at least, such demands as we have voiced for island trusteeships or for other naval bases appear mildly conservative as compared with Soviet claims for annexation of territory and for a general orbit of influence, under governments friendly to her, throughout eastern Europe in particular.

There can be no easy solution to that problem. Bi-focal vision, by which one nation can look through a second lens ground to the prescription of another, seldom is achieved in international affairs. The success of the San Francisco Conference will provide a mechanism for international definition of principles and procedures which at least might relieve the inevitable strains. Most important will be the record of how each of us proceeds in our respective courses of action. Soviet performance thus far is highly unsatisfactory to us. While we have taken pains to clear our procedure with her, she has taken action in the Baltic, in Austria, and in Poland without even advance notice to us.

A major test of our ability to cooperate may be found in the Allied administration of conquered Germany. The proposed four-headed control of a four-way partitioned nation promises to be at best an extremely awkward mechanism of administration. At worst, it can result in continuous and dangerous bickering between the representatives of Britain, France, the United States, and Russia in the Berlin coordinating center, and in hopelessly divergent procedures in their several zones of administration. There will be a compelling need for all of us to exercise all of the wisdom and cooperative resolve that we possibly can muster.

3. *A third testing ground for the future of American-Soviet relationships will be defined by the course of Russia in our continuing war with Japan. We are not unmindful of the toll paid by the Soviet Union in its magnificent European war effort. But we still are locked in a desperate struggle with an enemy that exemplifies the Fascism which America and Russia equally denounce. And that war is being fought in an area where Russian interests are importantly at stake.*

Russia has an extraordinary opportunity to create good will by throwing her weight speedily and effectively on our side. There is no doubt but that the final Pacific settlement will generate problems comparable with those of the European peace, but it is equally certain that continuation of the European comradeship in arms do much to promote an enduring and confident peace friendship.

4. *A fourth, and highly important, potential area of suspicion and irritation is the intellectual blockade that the Soviet Union has maintained against the free flow of travel, intercourse, and exchange of ideas.* We can understand the genesis of this policy and the reasons for its continuance while Russia entertained a complex fear of attack by powerful enemies. But the sustained perpetuation of such a quarantine by so strong a nation as the present U.S.S.R. could not be accepted as a protective measure. Inevitably it would generate suspicion; it was rather an instrument of nationalistic isolation even of contemplated aggression. A way-of-living at arm's length, with a nation that maintains such intellectual quarantines is possible; any whole-hearted partnership of effort is quite impracticable.

5. *Trading between a free-enterprise nation and one that operates all foreign commerce as a government monopoly can give rise to many frictions.* That subject is too complicated for exposition here. Suffice it to say that while difficult, it is not impossible to conduct such trade with mutual advantage. We are in a position to help Russia greatly with her program of industrial rehabilitation and expansion at great saving of cost in terms of our current scale of living. In return, we must have assurance that her government monopoly trading will be conducted for commercial rather than political ends and that it will be used to encourage rather than to restrict multilateral and non-discriminatory world trade.

☆ ☆ ☆

This is a representative list of the major areas in which misunderstanding and distrust may be generated, or allayed, in Russian-American relationships. No doubt, an equally honest list drawn by a citizen of the Soviet Union would be more heavily weighted with those features of our behavior which irritate and stimulate distrust on their side. If such a catalog were to be presented, it should receive our most searching and responsible consideration.

For it is of utmost importance that our two nations, in concert with the other United Nations, learn how to get along in mutual confidence and respect. Our understanding of each other now is so imperfect that our negotiations are punctuated with continuous irritations over *little issues.* This, inevitably, will continue until such matters are submerged in the general confidence that can be achieved only through satisfactory settlement of the *big issues.* We must succeed in this, or the defeat of Japan will merely mark the end of the Second in a series of World Wars.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

Electrical World
JUNE 23, 1945

The Challenge of Peace

Now that the war in Europe is over we can expect to hear more of the inside story of the contribution of American engineering to victory. In fact, some of the engineering achievements of electrical manufacturers are already coming to light.

Electrical engineers will be particularly conspicuous for what they have done. The application of radio technology has been one of the wonders of this war. Of great significance was the early and quick protection from mines. No less important, though perhaps less spectacular, was the equipping of military craft for land, air and water, with newly designed equipment to stand extreme operating conditions—not just a few, but quantities way beyond peace-time outputs. Likewise, credit goes to the electrical engineer who kept war industry supplied with all the electrical energy it could use without delay.

But that was war. That was all done under the pressure of a national emergency. There was a problem and it had to be solved then—not some indefinite time in the future. There was little question about efficiency. Would it work? That was the important thing. The American technical men were equal to that task. In fact, all the other warring nations have come to have a great respect for that priceless ingredient of American technology—the know-how to find out and the know-how to do.

Now, we are facing a new problem and one that poses a national emergency different in character but just as necessary to meet. How can we keep people and plant employed, increase the scale of living, reduce prices, meet foreign competition?

This war has taught us that there isn't a thing the engineer can't do if he only knows what end result is wanted and when. The problems of peace, however, are not nearly so clear—nor are they recognized so soon. The engineer has plenty of imagination when the problem is placed before him. Here is his chance to search out the problems of peace and to work on them.

It was definitely shown just prior to the war that the consumptive powers of this country were not equal to its productive powers and, since we have greatly increased the latter, we have new problems of employment to meet. If we cannot consume all we need to produce for economic well-being then we must find markets elsewhere.

Can American electrical goods compete in the foreign trade? Have we found out how to make equipment to foreign needs efficiently?

In the domestic market, what are the unserved wants of the public that can be taken care of electrically? What things can be done better than they are now being done? What equipment can be made obsolete by improvements?

It is generally accepted now that employment is not created or maintained by limiting labor's productivity. This country has swung around to the belief that the more we can make for less money the greater will be the standard of living. So we need new things to sell, we need improved things to take the place of the old, we need things that will compete in the foreign market.

If the engineers will give us these things just as brilliantly as they furnished the answers to the problems of war, our salesmen will produce the orders that will keep up employment. After the first flush of pent-up business is over and we settle down to the business of peace, we shall need the answers—and they better be good.

Overall Meter Testing Costs Reduced

High-accuracy, split-core type current transformers reduce costs, eliminate expensive switches and decrease hazard in making overall meter tests—Two sizes of current transformers employed

A. D. IRION,* Southern California Edison Co., Los Angeles, Calif.

BY USING precision built, high-accuracy, split-core current transformers for overall testing of meters, Southern California Edison Co. has reduced meter testing costs, eliminated the necessity for expensive switches for making hot cut-ins, saved space on customers' switchboards, and has materially reduced the hazard involved in overall testing of meters. The practice of making an overall test of the wattmeter and current transformers on industrial and commercial installations has been followed by the Edison company for many years. Prior to the development of a high-accuracy, split-core type current transformer within the past few years it required quite a little time to make cut-ins and there was a certain amount of hazard involved in making overall tests.

Two sizes of current transformers are employed, as shown by the accompanying photographs. These were built by Electrical Facilities, Inc., of Oakland, Calif., and were designed for specified burdens to meet the high accuracy requirements of watthour meter testing. In Fig. 1 is shown the smaller of the two types as it is being clamped onto transformer leads preparatory to test. This has a ratio of 600/1,200/2,400 to 5 amp. with one primary turn, and is insulated for 2,500 volts. On circuits of 11 and 16 kv., and where small currents are encountered, adapters have been built which provide insulation for these voltages. Two ratios are used, 75/150/300, and 10/20 and 40 to 5 amp. With this arrangement, flexibility is provided which permits the same high accuracy on the higher voltage circuits with currents from 5 to 300 amp., as is obtained with higher current values.

When employed on circuits of 11 and 16 kv., a cold cut-in utilizing special test switches, as shown in Fig. 2, is made. On circuits up to and including 4 kv., Y-connected, complete safety is provided by the insulation in the current transformer itself. In practice where heavy current and low voltage is encountered, which involves the majority of industrial installa-

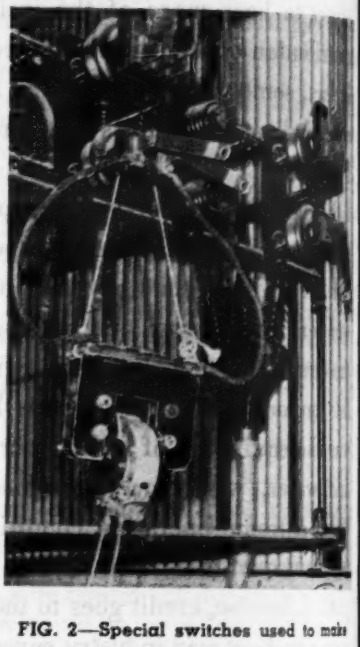
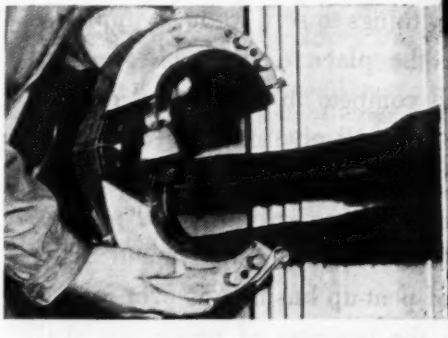


FIG. 2—Special switches used to make cold cut-ins on 11 and 16-kv. circuits



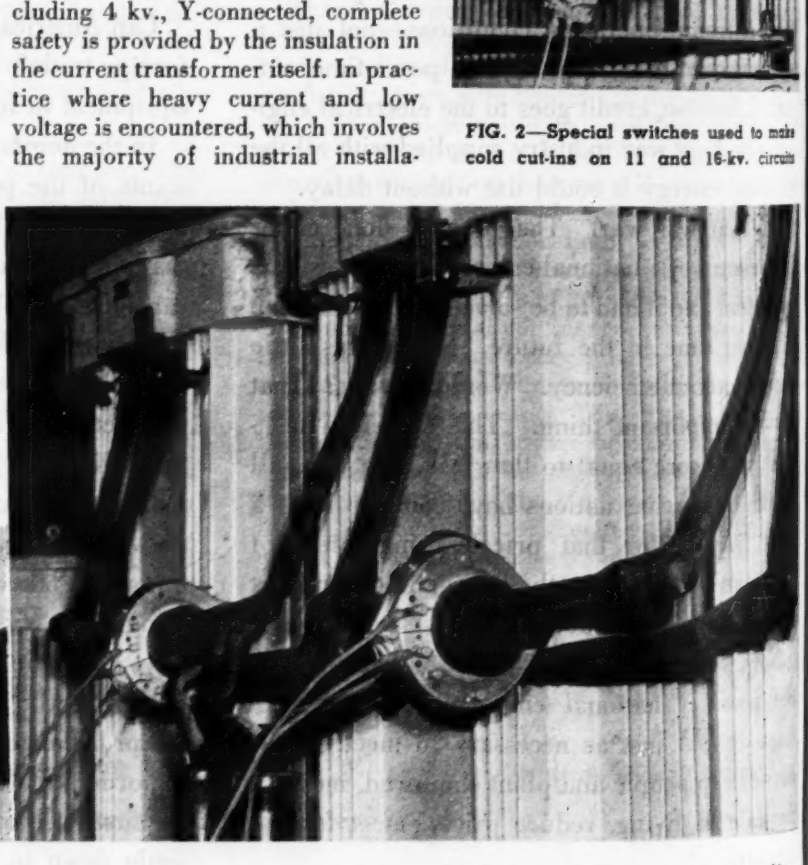


FIG. 1—Clamping precision built, high-accuracy, split core current transformer onto transformer leads (left) preparatory to making overall meter test. Current transformers are in place (right) with test leads to rotating standard attached

* Supervisor, Meter Tests

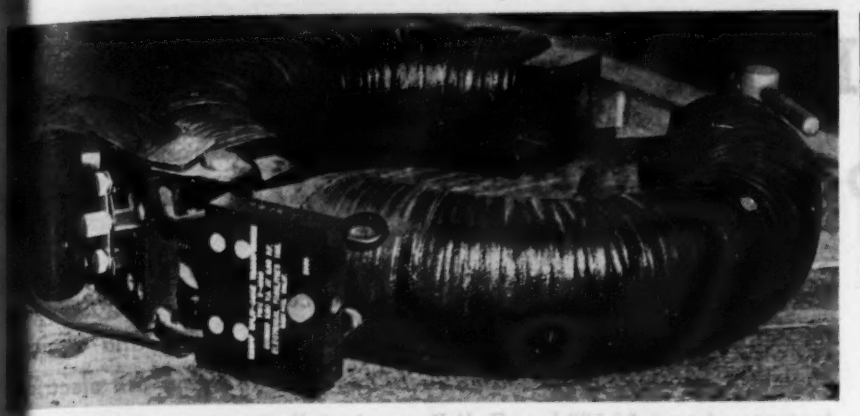


FIG. 3—Large diameter split-core current transformer used on high current, large bus and multiple cable installations; opening is approximately 8 in.

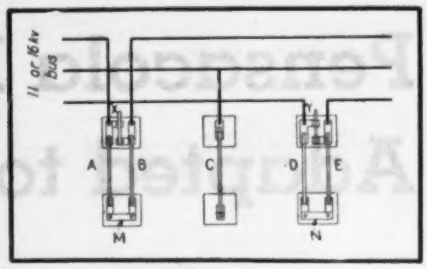


FIG. 4—Scheme of connections for 11 and 16-kv. test switches

ns, the ease with which these current transformers can be used provides maximum safety to the test man and virtually eliminates the possibility of service interruption to the customer.

Prior to the development of this high-accuracy, precision split-core current transformer, it was necessary to provide special facilities and use temporary cables to make cut-ins. These facilities consisted of a bypass type of test switch, both costly and requiring adequate space clearance. Elimination of the necessity for these switches has not only resulted in the saving of copper and other critical material, but has also enabled switchboard manufacturers to simplify their design and considerably reduce space requirements. Moreover, the time required for making cut-ins for meter tests has been reduced from a matter of hours to a few minutes, thus effecting a very material saving in overall meter testing costs.

High Capacity

Success and practicability of the type of current transformer discussed, resulted in the development of a similar precision built, high-accuracy current transformer for circuits in the order of 4,000 to 5,000 amp. This current transformer as illustrated in Fig. 3, is shown in the open position. The large opening of about 8 in. provided, permits use of this instrument on the largest busbars and multiple cable installations encountered on the Edison system.

Quite obviously, the development of these special current transformers came about as a result of the Southern California Edison Co.'s practice of including in the test the permanently installed current transformers in making watthour meter tests. This is a practice the company has followed for years and which it considers desirable and well justified. If only the watthour meter alone is tested, there is always the possibility of an error in the current transformers working to the disadvantage of the customer or the company over an indefinite period.

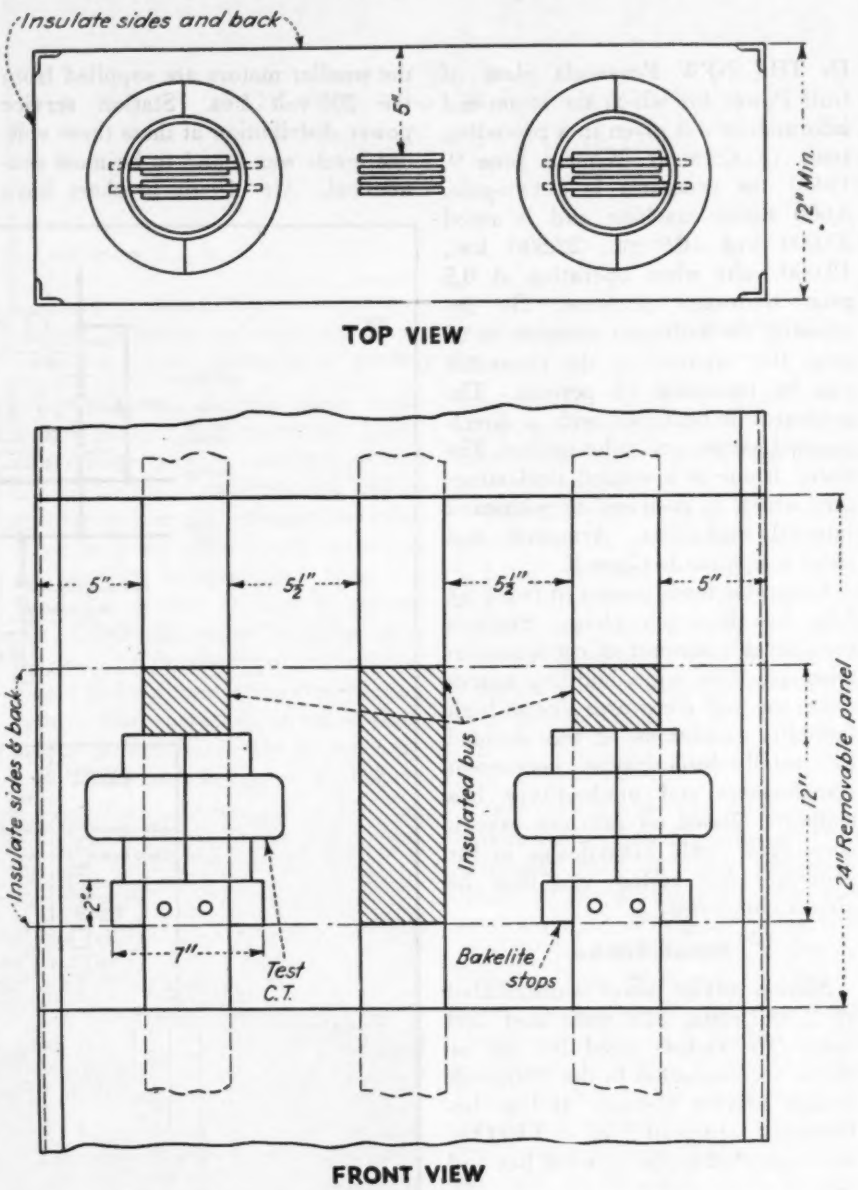


FIG. 5—Space requirements and bus arrangement for switchboard installations using split core type current transformers for meter testing. Voltage range, 120 to 2,400 volts, current range, 601 to 3,000 amp.

Pensacola Plant Simple, Adapted to Gulf Conditions—II

Combating humidity of the region, accessibility of switch-gear for maintenance, protection of station service motors and circuits, choice of cable insulation and sheathing, line relaying are electrical features of new 22,500-kw. Gulf Power installation

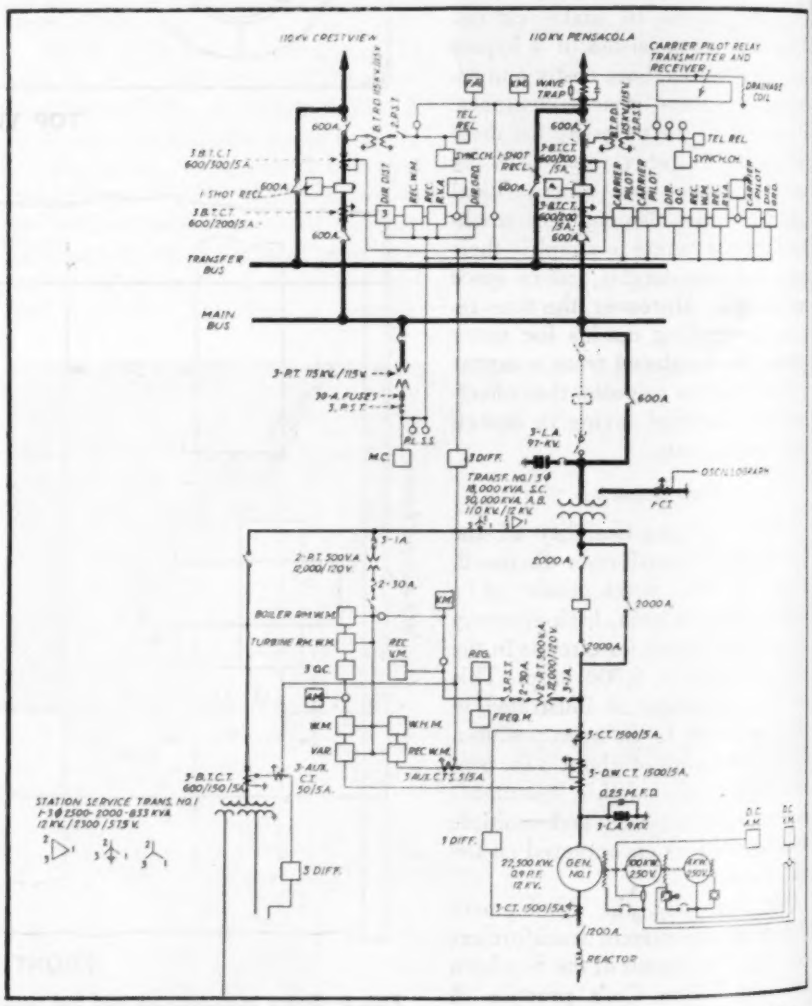
*E. C. GASTON, F. E. HALE and A. MERGENTHALER**

IN THE NEW Pensacola plant of Gulf Power for which the steam-end information was given in a preceding issue (ELECTRICAL WORLD, June 9, 1945) the generator is a two-pole, 3,600 r.p.m. machine and is rated 25,000 kva., 0.9 pf., 22,500 kw., 12,000 volts when operating at 0.5 psig. hydrogen pressure. By increasing the hydrogen pressure to 15 psig. the capacity of the generator can be increased 15 percent. The generator is equipped with a direct-coupled exciter and pilot exciter. The stator frame is a welded steel structure which is designed to withstand internal explosions. Armature and rotor insulation is Class B.

Generator leads consist of two ¼ by 3-in. bus bars per phase. Since a considerable amount of condensation takes place in large building spaces along the gulf coast area due to high humidity conditions, it was decided to install outdoor-type instrument transformers and outdoor-type bus supports. Based on previous experience, very costly breakdowns in the generator bus system can thus be almost eliminated.

Station Service

Station service power is distributed at 2,300 volts, 575 volts and 208 volts. The motors rated 100 hp. or above are connected to the 2,300-volt station service system. Motors between the ratings of 2 hp. and 100 hp. are connected to the 575-volt bus and the smaller motors are supplied from the 208-volt bus. Station service power distribution at these three voltage levels was found to be most economical. Air circuit breakers have been applied throughout the whole station service system. The 2,300-volt General Electric breakers are of the vertical-lift type and have an interrupting rating of 50,000 kva. The



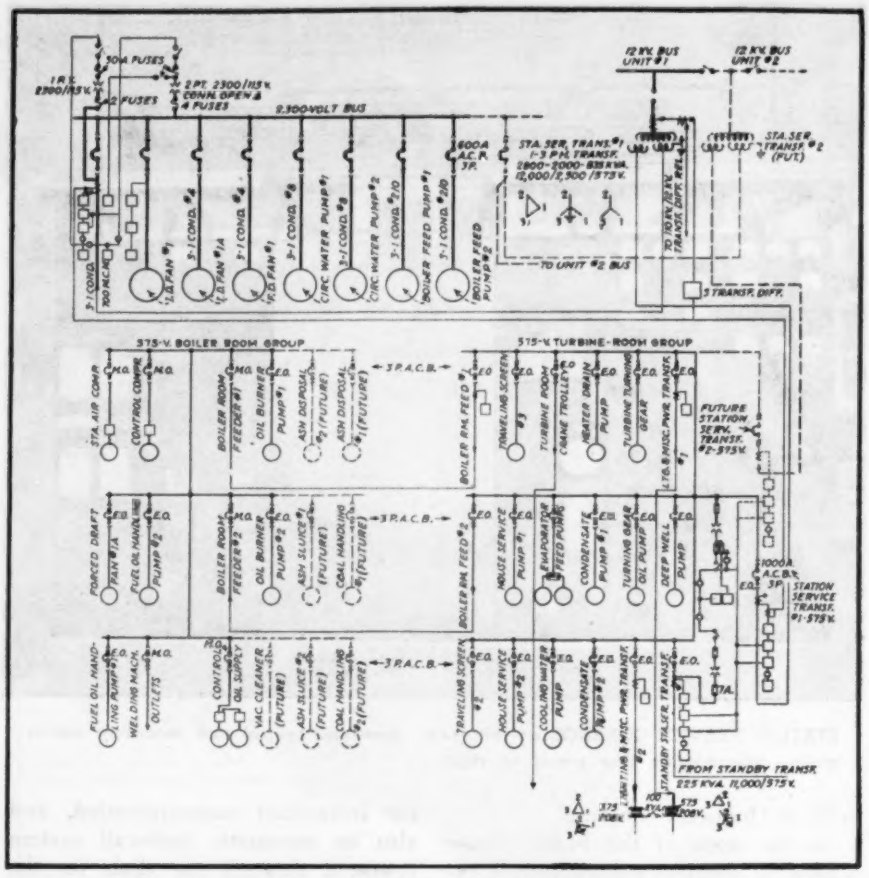
SINGLE LINE DIAGRAM of bus, station service and outgoing lines and their protective systems. Automatic telephone and code-call systems provided

* Engineer in charge of Design, Civil Engineer, Electrical Engineer, respectively, Commonwealth & Southern Corp., Birmingham, Ala.

bus and all connections in the 2,300-volt switch-gear compartments are insulated for full operating voltage. The vertical-lift-type breaker has an inherent clearance position. By lowering the breaker to the floor level, clearance can be obtained for maintenance work on the outgoing circuit without having to remove the breaker from its compartment, or running the risk of having some unauthorized person changing the adjustment. It also permits easy visual inspection for clearance.

The 575-volt, I-T-E switchgear is designed for stresses resulting from a maximum short circuit of 15,000 amp. This switchgear is also totally enclosed in steel compartments; however, the spacing of the buses and connections did not warrant the insulation of these parts within the compartments. In order to simplify the conduit layouts, this switchgear was split into two groups. One of these is located in the turbine room and the other one is in the boiler room.

The breakers are of the withdrawal type and are provided with a test position whereby each breaker can be disconnected by being moved into this position and tested within its respective compartment. In addition to the test position, there has also been provided a clearance position into which each breaker can be moved and locked within its respective compartment. This makes it possible to give clearance on the outgoing circuits during maintenance work without having to remove the breakers from their compartments.

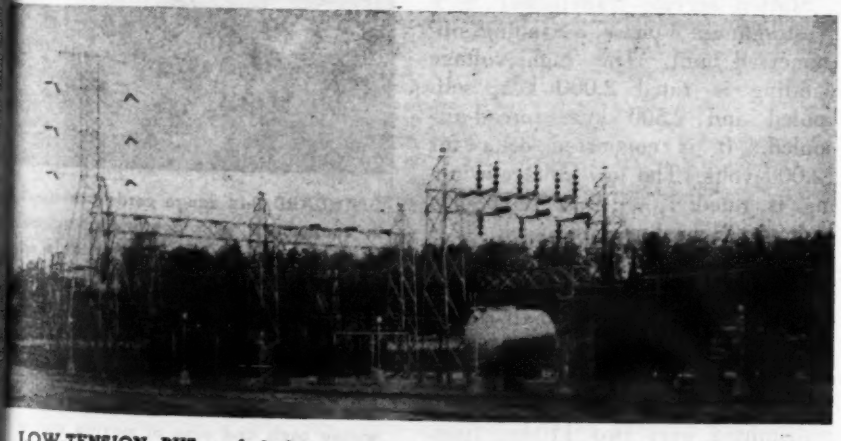


BUSES, FEEDERS, electrically and manually operated breakers and fuses for 2,300-volt and 575-volt auxiliaries for power station

Station Service Protection

In order to prevent any ground fault on the larger motors from developing into a phase-to-phase fault, it was decided to connect the 2,300-volt station service system wye and to operate the same grounded. Since a reliable thermal overcurrent relay (free from the influence of variations in ambient temperature) was not available, it was decided to protect the 2,300-volt motor circuits with 40 sec. induction-type overcurrent relays and with induction-type ground relays. The operating curves of these relays do not follow the motor heating curves as closely as a thermal relay would; however, actual operating experience proved them more dependable than the thermal relays in use at present.

The 575-volt system is wye-connected, but for economical reasons it is being operated ungrounded. Outgoing circuits are protected with thermal magnetic trip devices built into the breakers. Main supply circuits are protected with induction type overcurrent relays.



LOW-TENSION BUS and 3-phase power transformer adjacent to building. High tension breaker and pull-off to transmission at left

Electric Cables

Soil conditions and atmospheric conditions in the gulf coast area are extremely hard on cable insulation. Based on our experience in this area over a period of sixteen years with various types of insulation, it was decided to give preference to the oil base compound insulation. Since chemical conditions in the soil in this area result in a very short life of the lead-protected cable insulations, it was found advisable to eliminate the lead covering around cables wherever possible. In all areas where the ambient temperature does not exceed 45 deg. C., the cable has an insulation which consists of Okolite protected

STATION SERVICE CONTROL on left; next, generator control and recording instruments; transmission line panel at right

with an Okoprene covering.

In the area of the boiler house where the ambient temperature is expected to exceed 45 deg. C., asbestos-varnished, cambric-insulated, lead-covered cables have been installed.

All cables, including the 2,300-volt circuits, are terminated without potheads outdoors as well as indoors.

Special Provisions

It was considered necessary to protect the enclosed electrical equipment indoors and also the large motors against high humidity conditions. Electric heaters have been provided in all cubicles of the switchgear and also in the outlets of all large motors. All motors are completely drip-proof.

Any excessive vibration existing in a modern steam plant is usually caused by unbalanced fans. The modern turbo-generator unit causes very little vibration. In this case, the fans are supported directly from the base slab, which will make it almost impossible to transmit any vibration to the building. For these reasons it was not considered necessary to make any special provision on the main switchboard, the station service switchgear, and any other electrical equipment to guard against excessive vibration.

There has been provided a complete automatic telephone system for the intra-plant communication, and also an automatic code-call system operated through the dials on the telephones for calling any members of the operating personnel. Soundproof booths have been provided for all major telephones, since the noise level in a modern steam plant is always extremely high.

Transformers

Main transformer is a General Electric, 3-phase, oil-immersed unit with a self-cooled rating of 18,000 kva. and a forced-air-cooled rating of 24,000 kva. and 30,000 kva. using two sets of blowers. The voltage rating is 11,500 volts delta to 110,000 volts wye.

Station service transformer is a Westinghouse 3-phase, 3-winding, oil-immersed unit. The high voltage winding is rated 2,000 kva. self-cooled and 2,500 kva. forced-air-cooled. It is connected delta for 12,000 volts. The low voltage winding is rated 1,600 kva. self-cooled and 2,000 kva. force-air-cooled. It is connected wye for 2,300 volts. The tertiary winding has a 667-kva. self-cooled and 833-kva. forced-air-cooled rating. It is connected wye for 575 volts.

Outgoing power from this plant is transmitted over two 110-kv. lines. One of these lines terminates at the Pensacola Transmission Substation which is located only ten miles from the Pensacola Steam Plant. Carrier pilot wire relays have been applied for its protection. The second line terminates at Panama City and its approximate length is 80 miles. The same is protected by reactance relays. Provision has been made for the future addition of pilot wire relay protection on this line also, if the actual operating experience should prove necessary. Two 115-kv., pneumatically operated, oil circuit breakers have been installed for these two lines.

A pneumatically operated 2,000-amp., oil circuit breaker has been installed on the low tension side of the main transformer bank.

Since this plant is located in the hurricane zone, the substation steel structures and their foundations have been designed for a maximum wind velocity of 120 mph.

Outdoor conduits consist of two-inch Transite Korducts encased in concrete. The outdoor cables are also of the oil base compound insulation type protected with an Okoprene covering.

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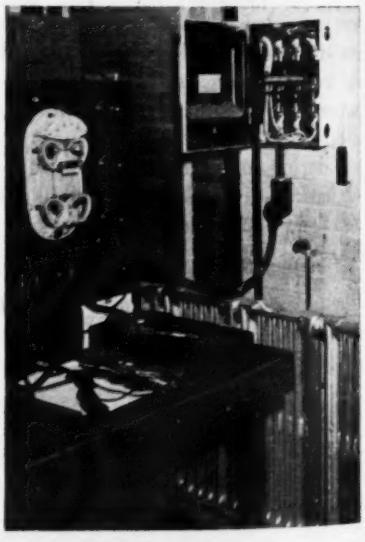
Range Cord Connection



STANDARD 3-ft. range cords are used in conjunction with a standard range outlet to connect the main terminals of the meter test boards in the Pennsylvania Electric Co.'s Bradford meter test shop to the 220-volt supply. One such installation is illustrated. The main advantages resulting from this adaptation of the range cord are reduction in wiring costs and ease of moving meter test board during room alterations

Multi-Purpose Dams Ineffective for Flood Control

Objectives of flood control and power storage are antithetical—Natural valley storage obliterated by power developments—Multi-purpose reservoirs may accentuate flood crests—Flood control not automatic as with slotted retaining dams and dry basins

C. N. PHILLIPS, Ebasco Services, Inc., New York*

IN RECENT YEARS so-called multi-purpose dams have been built on the ground that they constitute a cure for the flood evil. Power development is combined with one or more of the navigation, irrigation and flood control objectives on a basis of equality; other minor objectives, such as water conservation, recreation, silt control and stream polution abatement are counted as added benefits.

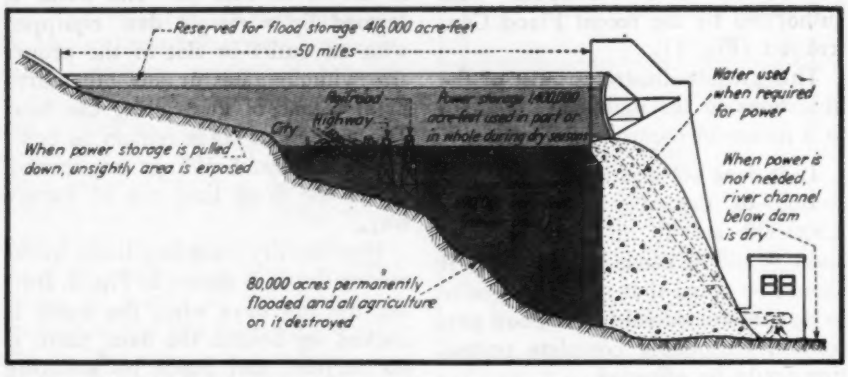

Reserved for flood storage 416,000 acre-feet
50 miles
Water used when required for power
Railroad
Highway
City
Power storage 1,400,000 acre-feet used in part or in whole during dry season
When power storage is pulled down, unsightly area is exposed
When power is not needed, river channel below dam is dry
80,000 acres permanently flooded and all agriculture on it destroyed

FIG. 1—Foreshortened representation of multi-purpose 50-mile reservoir and dam shows only 416,000 acre-ft. reserved for flood storage. Twice this amount is dead storage—never used. Example of dam authorized by Flood Control Act

Limitations of "Multi-Purpose"

There are a number of serious objections to the multi-purpose dam for flood control as contrasted with the standard methods which have been described. Among these objections are:

1. The power objective and the flood control objective are direct opposites and cannot be realized on a basis of equality. Flood control is for the purpose of getting rid of flood water safely but as quickly as possible. Power reservoirs are for the purpose of saving flood waters for use many months later.

2. Such a large amount of valuable storage space generally is devoted to power that the remaining capacity is not sufficient to afford complete protection against floods.

3. A large amount of natural valley storage space is destroyed by the permanent lakes necessary for power.

4. The permanent lakes needed for power speed up and increase the crest heights of floods.

5. Multi-purpose dams are more costly to build per acre-foot of net flood storage than dry retarding basins, cause great loss of crop production through destruction of rich farm lands, and in many localities will gradually lose their capacity through silt deposits. They also cause a major disruption of the economic and social life of the community, and frequently destroy a considerable part of the local tax revenues.

6. The temptation is always present to divert essential flood control storage space to power production.

7. The flood control protection

* Adapted from paper recently presented at Atlanta meeting of Engineering and Operation Section of Southeastern Electric Exchange (See also "Flood Control Requires Valleys Nature Provides" in ELECTRICAL WORLD, May 26, 1945, page 76).

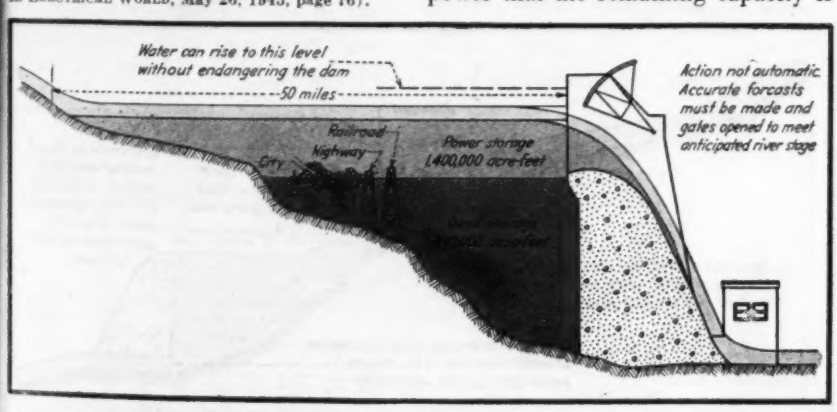

Water can rise to this level without endangering the dam
50 miles
Action not automatic. Accurate forcasts must be made and gates opened to meet anticipated river stage
Railroad
Highway
City
Power storage 1,400,000 acre-feet

FIG. 2—Multi-purpose dam may create enhanced flood by releasing some power-storage as well as flood storage; a condition non-existent if dam was not there

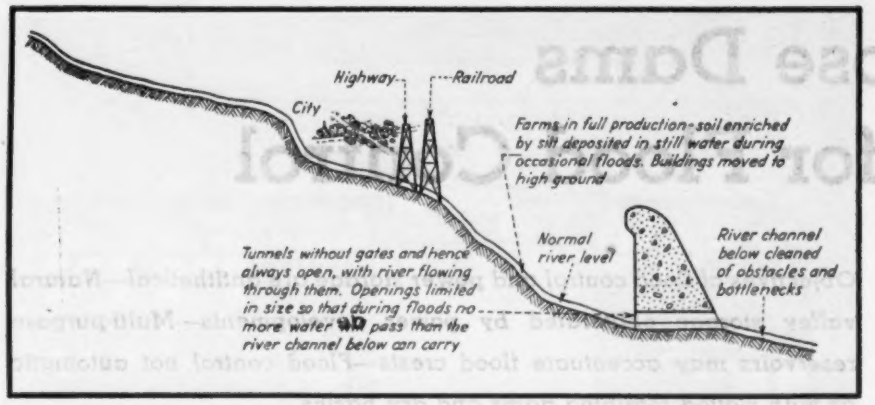

Highway
Railroad
City
Farms in full production - soil enriched by silt deposited in still water during occasional floods. Buildings moved to high ground
Normal river level
River channel below cleaned of obstacles and bottlenecks
Tunnels without gates and hence always open, with river flowing through them. Openings limited in size so that during floods no more water can pass than the river channel below can carry

FIG. 3—Dry retarding basin for temporary storage of flood waters offers no obstacle to normal flows, leaves natural storage areas for temporary withholding of run-off

afforded by the dam is not automatic.

These objections are discussed by means of a series of diagrams, pertaining to a multi-purpose dam authorized by the recent Flood Control Act (Fig. 1).

This project illustrates most of the objections to the multi-purpose dam as a means of controlling floods.

1. It does not afford complete protection to the area below. Over 2,500,000 acre-ft. of flood control space would be needed to do that. It should be noted that if the dam were to be constructed solely for flood protection, reasonably complete protection could be afforded.

2. About 80,000 acres of land would be permanently flooded and removed from agricultural production and about 30,000 acres flooded occasionally.

3. Towns, railroads and highways would be flooded out.

4. The temptation would be present to encroach on the flood control space for power production.

5. The reservoir would not be desirable from a recreation standpoint, because the large power drawdown would expose an unsightly and unsanitary beach.

Dry Basin Action

How the multi-purpose project will act during floods is shown in Fig. 2. As the flood control space will not completely control floods, the gates must be raised when the flood level reaches their top. Then the power storage can run out too, and thus the structure can actually produce a bigger flood crest below the dam than would have taken place if the multi-purpose dam were not there.

A true dry reservoir flood control dam with the same gross flood control space (416,000 acre-ft.) as the multi-purpose project built at the same site is shown in Fig. 3. The basin is formed by a simple dam equipped with an outlet or slot of the proper size without gates or any other artificial means of controlling the flow. The rich farm lands remain in cultivation. Farm buildings are located above the flood line, out of harm's way.

How the dry retarding basin works during floods is shown in Fig. 4. During the few days when the water is backed up behind the dam, there is no current, and hence no scouring takes place. Instead, the lands are enriched by the silt deposited in the still water. Most floods occur before the growing season and there is little, if any, crop damage. Much less land is involved. The town is high and dry.

A true flood control dam is much less expensive than a multi-purpose dam as can be seen from Fig. 5.

One multi-purpose dam (Fig. 6) which has been built and is in service, has been tested by a big flood. It failed of its purpose.

On January 4, 1939, Major General J. L. Schley, Chief of Engineers, U. S. Army, in recommending the construction of this reservoir, (which is the first of three of the series on the river) had said:

"I believe, however, that the need for controlling flood flows . . . makes it advisable to construct one of the reservoirs at an early date. Installation of power features would be deferred and the entire storage capacity utilized for flood control until . . . construction of the third reservoir."

Principles Ignored

If this recommendation had been followed, over 2,000,000 acre-ft. would have been available for flood control at this point. But in spite of the General's warning, the power facilities were installed before the other reservoirs were built and the flood control storage capacity was reduced to the top 20 ft. of the reservoir, which contained 960,000 acre-ft. of space. Then as the power plant was operated, another 10 ft. was taken over for power, leaving but 540,000 acre-ft. for the gross storage capacity for floods. This reduced the net storage for floods to about 100,000 acre-ft., which in such a large drainage area is negligible.

In May of 1943, a heavy storm swept the watershed. Over 10 in. of rain fell at some points in a three-day period. As a result, a heavy flood swept down the river, already swollen by an earlier rise. On May 13, the crest at a critical point on the river reached a level 3.7 ft. above the previous record. The levees were overtopped and it is estimated that over

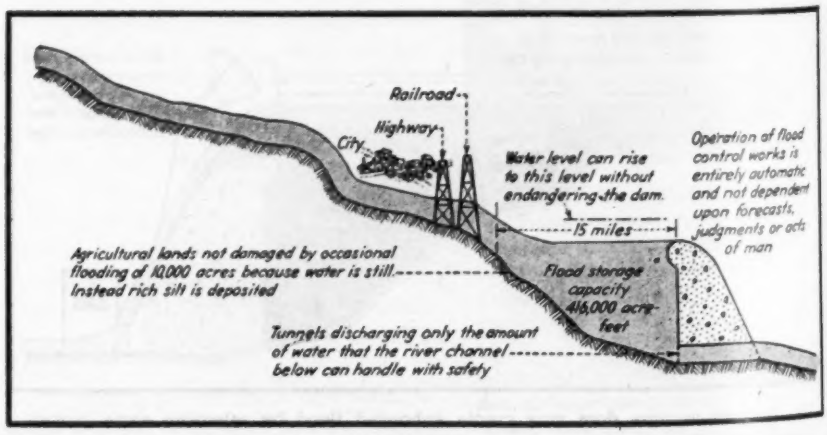

Railroad
Highway
City
Water level can rise to this level without endangering the dam.
15 miles
Operation of flood control works is entirely automatic and not dependent upon forecasts, judgments or acts of man
Agricultural lands not damaged by occasional flooding of 10,000 acres because water is still. Instead rich silt is deposited
Flood storage capacity 416,000 acre-feet
Tunnels discharging only the amount of water that the river channel below can handle with safety

FIG. 4—Dry retarding basin in action during flood

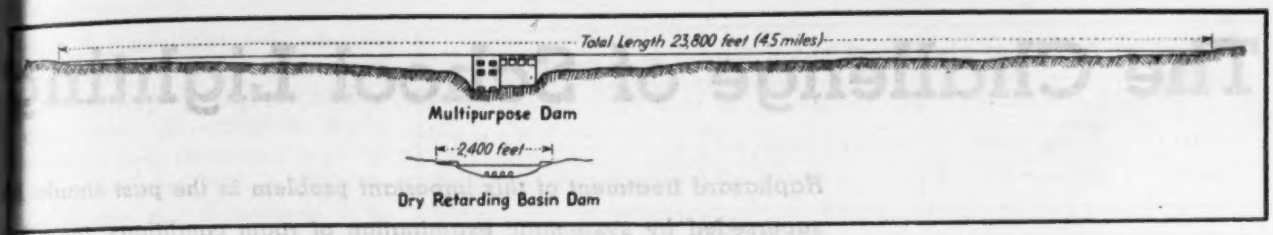


FIG. 5—Comparison between length of multi-purpose dam and dry retarding-basin dam having same flood control storage capacity. In this instance the widths of basin flooded are on practically 10.1 ratio

$50,000,000 of damage was done. The multi-purpose power and flood control dam, built to meet such catastrophes, failed in its purpose. It was full of water stored for power and instead of holding back the flood, it is reported to have actually increased the height of the crest of the flood below when its gates were opened belatedly.

Loss of Crops

A recent report advocates a multi-purpose project to cost over a half billion dollars, over $266 million of which would be for the additional reservoirs to be approved. These reservoirs would flood permanently about 288,000 acres of land, over 152,500 of which are under cultivation. This same reports sets an annual crop value of over $40.60 per acre for the cultivated land but the resulting annual loss of $6,300,000 in crop values is ignored in the report that purports to justify the project. The average annual flood benefits claimed from all sources is but $912,800, or only about 14½ percent of the loss in crop values. The project will not provide complete protection for the valley, the claims of benefits being for the reduction in stage during minor floods. To show how little this great expenditure of money will affect big floods, the report says that the maximum flood of record will be reduced only one tenth of a foot at the largest city in the drainage area. Figures such as these are so far inside of the range of error in the calculations as to be meaningless. The actual result might well be an increase in stage for the same flood. Every objection listed in this paper to multi-purpose dams for flood control is applicable to this project.

An examination of the 21 valley projects representing a total of 114 dams in the recent Flood Control and Rivers and Harbors bills which included flood control in the list of their stated purposes, shows that not a single one of these enterprises would afford complete protection against floods. On the contrary, the flood control present was in some cases infinitesimal. Every one of these valley plans in respect to their flood control features are open to all of the objections listed in this paper. In each case, the great annual loss in agricultural output by reason of the permanent flooding of the best farm land in the area and the economic loss due to the displacement of a large number of families and small businesses, is ignored as well as the all important item of taxes.

Other Omissions

There are other omissions in the economics used to justify multi-purpose enterprises. For example, the formulae used for the value of power are far from realities, (Fig 7). This, on an equitable basis at present-day interest rates and without taxes, shows:

1. The actual cost of electric power from a multi-purpose dam in use.
2. The formulae now being used in the same area as the value of steam—electric power used to justify more multi-purpose dams.
3. The actual cost of steam-electric power from a plant recently put in service in the same service area.

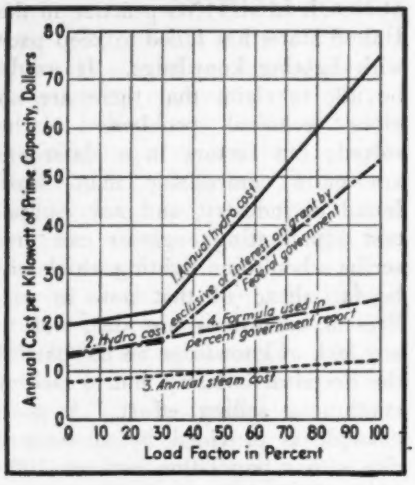

Annual Cost per Kilowatt of Prime Capacity, Dollars
Load Factor in Percent
1. Annual hydro cost exclusive of interest on grant by federal government
2. Hydro cost
3. Annual steam cost
4. Formula used in percent government report

FIG. 7—Comparison between government hydroelectric power and equivalent steam-electric power. Actual construction and actual operating costs used in plotting curves 1, 2 and 3; also 3½ percent interest on construction costs; 3 percent depreciation on steam plant, 1 percent depreciation on hydro plant, no taxes. Credit given hydro for average annual secondary energy at one mill per kw.-hr.

Many of the other data used to justify multi-purpose enterprises are as far removed from realities as this power value formula. Unsound economics wastes Federal funds, and, probably even of more importance, may be the basis of unwise decisions and poorly designed works.

Flood control should be the paramount purpose of the projects built to accomplish it. Attempts to subordinate it and impair its effectiveness by combining it in multi-purpose projects with other objectives on a basis of equality should be prevented. Otherwise the safety of many communities may be compromised.

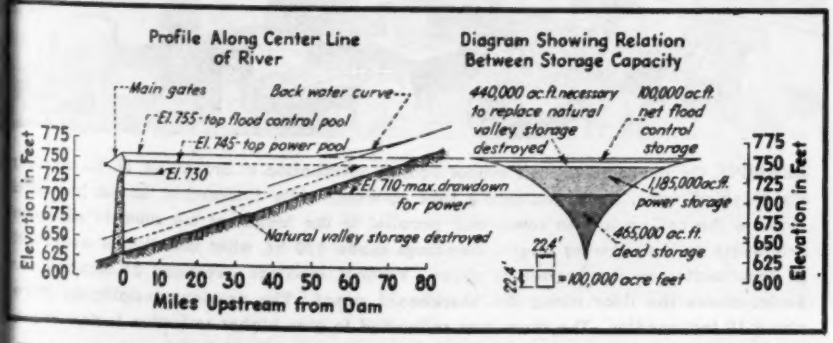

Profile Along Center Line of River
Diagram Showing Relation Between Storage Capacity
Main gates
Back water curve
El. 755 top flood control pool
El. 745 top power pool
El. 730
El. 710 max. drawdown for power
Natural valley storage destroyed
440,000 ac.ft. necessary to replace natural valley storage destroyed
100,000 ac.ft. net flood control storage
1,185,000 ac.ft. power storage
465,000 ac.ft. dead storage
22.4'
= 100,000 acre feet
Elevation in Feet
Miles Upstream from Dam

FIG. 6—A multi-purpose dam that failed to afford flood control

The Challenge of School Lighting

Haphazard treatment of this important problem in the past should be superseded by systematic examination of room conditions, adoption of modern standards, vision conserving equipment and regular maintenance schedules conscientiously followed

***WILLARD ALLPHIN**, Sylvania Electric Product, Inc., Salem, Mass.*

SCHOOL LIGHTING practice in the United States has failed to keep pace with lighting knowledge. It would be idle to claim that there are no more technical problems to be solved; but factors in a classroom are more controllable than those found in industry, and any competent illuminating engineer can prescribe schoolroom lighting which will be far ahead of that now in use. Present conditions are due, not to any lack of knowledge on the part of the electrical industry, but to lack of continuous selling effort. A good example is provided by an eastern city with a population between 100,000 and 150,000.

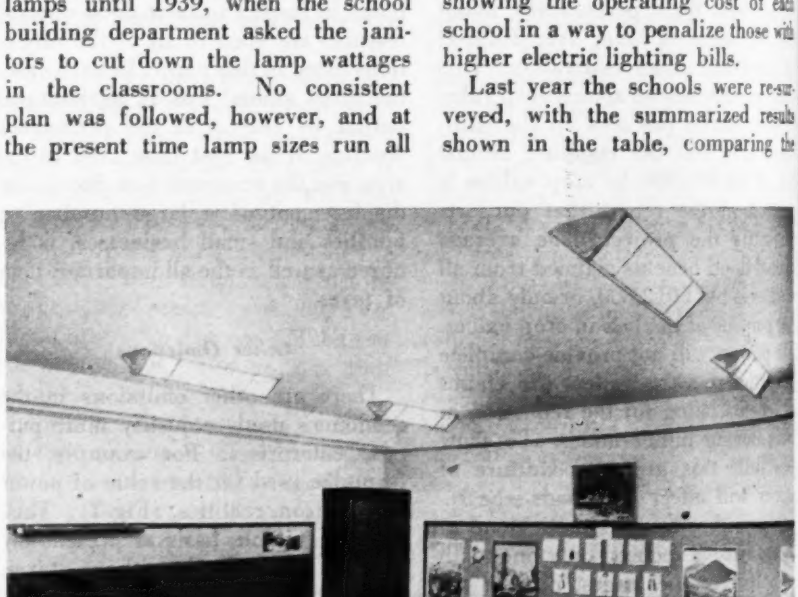
Earlier Surveys

In late 1925, the local utility company in the above city trained a man to sell and engineer lighting. In 1926 he asked for and received permission to survey the school lighting. Results were reported to the school committee and relighting recommendations made, based on the American recommended practice of that time. Continued work with the committee brought about the first important changes, in 1927. The then gas-lighted high school was wired and relighted to the recommended standard, and two "sight saving" rooms in a grade school were each changed from an installation of ten 60-watt bare lamps to five 500-watt indirect luminaires. The rooms were refinished in light colors. Then, in 1928 and 1929, two new schools were built in which the recommended standard of six 200-watt enclosing globes per room was followed. After this progressive beginning, however, the utility relaxed its efforts in the sale of school lighting for several years.

From 1934 to 1936 Federal money was used to bring all of the older city schools up to a certain minimum standard. This involved the installation of four 11-in. enclosing globes per room, with 150-watt lamps. While this was materially below the recommended practice, it was none the less an improvement over bare lamps until 1939, when the school building department asked the janitors to cut down the lamp wattages in the classrooms. No consistent plan was followed, however, and at the present time lamp sizes run all the way from 60 to 200 watts. Although doubtless the foregoing cut in wattages was instituted as an "economy move", the reduction would have been more understandable if made five or six years earlier.

At about the time the wattage reductions were begun, a practice of circulating a monthly report to principals and janitors was inaugurated, showing the operating cost of each school in a way to penalize those with higher electric lighting bills.

Last year the schools were re-surveyed, with the summarized results shown in the table, comparing the



EXAMPLE OF A PRESENT-DAY school lighting installation at Bronxville, N. Y., utilizing six shielded units, each containing four 40-watt, white fluorescent lamps, mounted close to the ceiling in two rows, and parallel to the length of the room to minimize brightness at the viewing angle. Readings made 100 hr. after installation averaged 27 foot-candles on the horizontal plane. Vertical readings averaged 27 foot-candles 60 in. above the floor along the blackboard areas. The previous installation gave about 10 foot-candles. The room was refinished to give higher reflection factors when newly equipped. Room is 22 ft. by 28 ft. with ceiling height 11 ft. 6 in.

* Applications Engineer, Lighting Division.

1926 with these latest developments. The change in the sight-saving rooms was very apparent. Children having vision correctible to 20/50 are sent to these classrooms from all schools. The lower limit is ability to count fingers at a distance of 5 ft. Any child with a poorer vision than this is transferred to an institution for the blind.

In the 1944 survey it was shown that due to reduction in lamp wattages, to dirty luminaires and to badly depreciated paint, the illumination level on the desk tops had fallen from 14 to 4.5 foot-candles. It is probable that if someone had kept the school department interested in lighting, it is unlikely that the rooms would have been allowed to depreciate so much. Such conditions emphasize the sales nature of the school lighting problem. While someone unquestionably meant well when the enclosing globes were installed in the old schools, only a few years later the wattages were reduced and on a random basis at that. Whatever difference of opinion there may be about minimum requirements, there surely can be no defense of a hit-or-miss program in which one school uses lamps of one-third the rating of those of another school employing the same type of fixture.

Challenge to the Utility Man

If we grant that school lighting is a selling problem, then on whom should the obligation fall? I believe it should be the utility lighting man. True, he will be accused of trying to build up company revenue, but good selling can overcome this attitude.

A national manufacturer would be unable to put a man into every community to do such a selling job. The utility man, on the other hand, is always there. He can see this person today and that one tomorrow, meanwhile carrying on with his other work. His company has a greater stake in the community than has any other branch of the electrical industry, and should be foremost to remove the blot of bad school lighting.

The idea should be sold and resold to the school committee, school superintendent, building superintendent and to teachers and parents, with a specific program in mind.

First of all, competitive ratings in which a low electric bill wins a good mark must be abolished. The school department should adopt the American Recommended Practice of School Lighting and enforce the standards of lighting control and intensity advised in it. Lighting equipment can be brought into line with the standards within a reasonable time by seeing to it that any new construction meets the standards; by increasing lamp sizes in older installations where fixture sizes permit; and by scheduling some relighting each year, beginning with the worst schools.

Comparison of School Room Equipment in City Surveyed

	1926		1944	
	FIXTURES	LAMPS	FIXTURES	LAMPS
Worst lighted schools in system..	No artificial light.	.....	4–11″ enclosing globes	60 watt
General range of older schools*..	4 bare lamps	60 watt	4–11″ enclosing globes	75 watt
General range of newer schools..	12″ enclosing globes	100 watt	4–12″ enclosing globes	100 watt
Best lighted schools.....	14″ enclosing globes	150 watt	6–14″ enclosing globes	†200 watt
American recommended practice of school lighting.	14″ enclosing globes	200 watt	6–14″ indirect for best practice	3–500 watt 3–300 watt

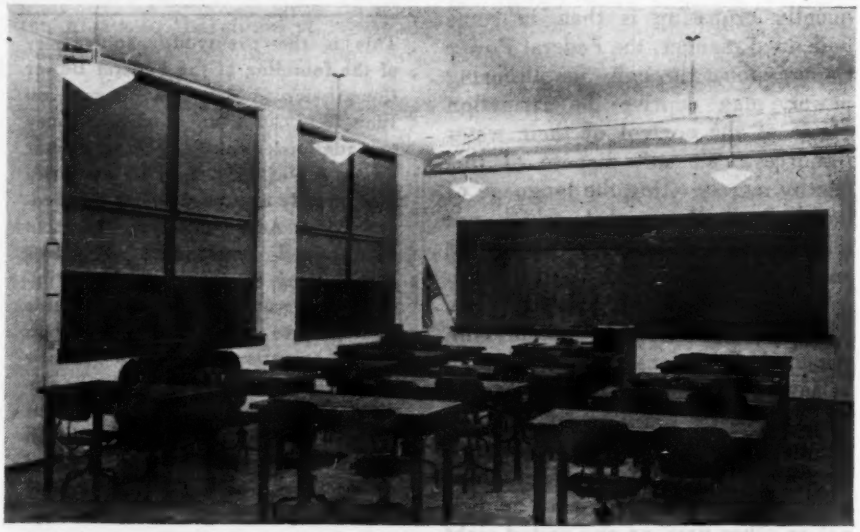
* In 1934–6. The older schools were equipped with four 11-in. globes (150-watt lamps) per room, a marked improvement over bare lamps but unfortunately lamp wattages were reduced hit-or-miss in 1939 in an inconsistent drive to cut lighting bills.
† Three rooms in one school have better than this because they are equipped for sight-saving classes.

Maintenance

A strict maintenance program should also be established. The school building department should set lamp sizes to conform to the standard, and a janitor should be issued whatever lamps a chart in the central stockroom specifies for his school. A schedule for fixture cleaning and the replacement of blackened lamps should be set up with the supervisors made responsible for having it followed. The best method, now being used in a few cities, provides for all fixture cleaning and relamping by a crew of men with a truck, following a regular schedule. Monthly inspections should be specified and school nurses would be a logical choice for the inspection work because of the influence of school lighting on the health of the children. Nurses should be equipped with light meters which will enable them to check the maintenance program and advise principals and teachers as to the daylight conditions under which it is desirable to turn on the lights.

It is important that each light meter be factory tested at least yearly, and this might possibly be undertaken as a community service by the utility.

Where an active parent-teachers' association, woman's club or other organization can be interested in the school lighting problem, it can be of help in keeping the subject alive and standards up.



INITIAL AVERAGE ILLUMINATION of 50 foot-candles in this Atlantic City, N. J., classroom from 10 semi-indirect luminaires with 500-watt lamps

Accomplishments of FPC

An appraisal of the more important activities of the Federal Power Commission during its first quarter century of regulation of electric utilities together with a clarification of some of its objectives

BASIL MANLY, Chairman, Federal Power Commission

THE EDITOR of ELECTRICAL WORLD has asked me to review for his readers the accomplishments of the Federal Power Commission since its creation 25 years ago. I am glad to have this opportunity, for I do not believe that everyone in the electric utility industry has a clear idea of what the Commission has or has not done.

The oldest of the misleading statements we have had to meet is the charge that the commission has sought to extend its licensing authority to every creek and rivulet in the United States, or as one distinguished attorney emotionally declared, "to every drop of water that falls upon the mountain side." The absurdity of this charge is best demonstrated by citing the fact that the Commission has refused to take jurisdiction in more than half the cases in which "declarations of intention" have been filed for the construction of hydro projects on streams about which the applicant had some question.

Another false charge that frequently crops up is that, in some undefined manner, the Federal Power Commission, through its licensing power, may deprive the irrigation States of the control of their water resources. We can dispose of this one by merely citing the language of the Federal Power Act, which not only requires a licensee to prove that he has complied with the requirements of State laws, but specifically provides that "nothing herein contained shall be construed as affecting or intending to affect or in any way interfere with the laws of the respective States relating to the control, appropriation, use, or distribution of water used in irrigation or for municipal or other uses, or any vested right acquired therein."

Still another hardy perennial is the charge that the Commission is reaching out to control local electric rates. To my knowledge, there has been only one case in which the Commission has even remotely touched what might be regarded as a local rate. That was a case in which a New England company, clearly subject to our jurisdiction, had filed with the Federal Power Commission a new rate that would increase charges to a local distributing company about $150,000 a year. Upon advice from the State Commission that the increase was the result of a statewide fuel adjustment which it had approved, our Commission vacated its suspension and allowed the rate to become effective.

It is true that we do sometimes encounter cases in which it would require the wisdom of King Solomon himself to determine the exact line of demarcation between interstate transmission and local distribution. But we have felt in these cases that, although we could save ourselves some headaches by avoiding the issue, it was our duty to present these doubtful cases to the courts for their final and controlling decision so that we could have some guidance if the same issue recurred.

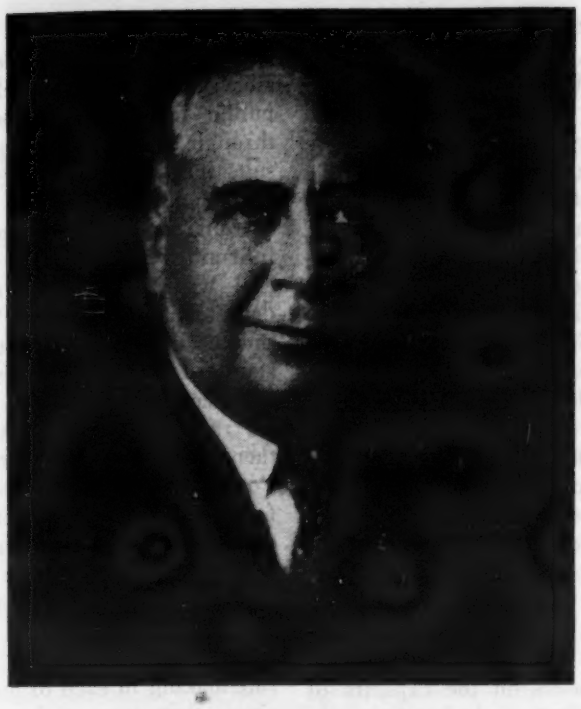
While there are other examples of what the Commission has not done, I believe that the three illustrations above will serve the purpose, so I'll turn to what the Commission has done.

This is the twenty-fifth anniversary of the founding of the Federal Power Commission which was begun on June 23, 1920, as an ex-officio agency to administer the Federal Water Power Act of 1920. In 1935 its duties were greatly expanded under the Federal Power Act. Other acts, executive orders and presidential directives have further extended its area of operation. Because the activities of this agency have a greater effect upon utility operation than those of any other single regulatory body, we invited the present chairman, who has been a member of the Commission for the past 12 years, to write a critical estimate of what had been accomplished by FPC in its several approaches to utility regulation.
The Editors.

Pioneering Work

The functions that the Congress has assigned to the Federal Power Commission through the Federal Power Act of 1935 and its predecessor, the Federal Water Power Act of 1920, have been of a pioneering character. The licensing of hydroelectric projects on the navigable waters and public lands of the United States; the establishment of "actual legitimate investment" as a basis for the Federal recapture of licensed projects and for regulation of interstate electric rates; and the formulation and administration of uniform accounting controls have been pioneering problems for which neither chart nor compass was definitely provided by the experience of other agencies, or by pre-existing decisions of the Courts. All of these functions, and the others entrusted to us, add up to only one thing—the regulation of essential utility services. The Commission did not seek its responsibilities; it was created by Congress to perform them.

We have thus had to blaze our own trails, guided by the best interpretations we could find for the intent of Congress as expressed in statutes which, because of the hitherto unexplored nature of the problems, were necessarily general in their provisions. We have undoubtedly made some mis-



Basil
Manly

Photo by Blank-Stoller

takes, but such as they are, they cannot be many or serious. I say this because, while our decisions have been challenged in every Circuit Court of Appeals in the United States, with numerous appeals to the Supreme Court, we have not actually been reversed on a single major issue, in my opinion.

Original Cost

The overwhelming majority of the matters coming before the Commission are settled, of course, without litigation, and that's the way we prefer to settle them. Let's take the matter of "original cost" determinations which provide the essential basis for the establishment of an effective uniform system of accounts. Out of a total of 113 determinations, only three have been in litigation. In the most closely contested and vitally important of these, the Northwestern Electric Co. case, the Commission's position was unanimously sustained by the Supreme Court in a decision written by Mr. Justice Roberts.

The bulk of our "original cost" cases have been handled out of court, and we have dealt with a number of rate cases by the same procedure. Primarily through this method we have arrived at determinations which have eliminated nearly a billion dollars of write-ups and other intangibles from the books of 113 electric utilities having combined plant assets as of January 1, 1937 of about $3,600,000,000 and constituting, on that basis, approximately 60 percent of the privately owned electric utility industry subject to the Commission's accounting requirements.

What has been the result of this "dehydration" program to date? Has the elimination of "water" from the accounts of the companies tended to lower the financial position of the privately owned electric utility industry, or has it had a beneficial effect on the industry as a whole?

The answer is this: The application of the uniform system of accounts has brought the electric utilities out of a precarious financial position and into the soundest financial position in their history. I have not made any current calculations, but I can refer to our report entitled "The Financial Record of the Electric Utility Industry," issued last autumn, which, among other items that revealed increased financial strength, showed that the average yield on electric utility bonds as published by Moody's Investors Service was 4.03 percent at the end of 1937 and had declined to 2.94 percent by September 1944.

We have just finished conducting, at the request of the Department of Commerce, a survey to indicate what the electric utility industry believes will be the effect of the end of the European War upon its construction program. That survey shows that the industry plans gross additions to plant within the next 12 months amounting to $529,000,000, estimates expenditures for maintenance at $208,000,000, and expenditures to increase depleted inventories of materials and supplies at $24,000,000. Of this $761,000,000 planned outlay of the electric utility industry within the next 12 months, 94 percent of $716,000,000 will be available from general cash on hand or from current operations and only $45,000,000 is to be obtained from the issuance of securities. That doesn't sound to me as though write-downs have weakened the financial position of the electric utility industry.

Rate of Return

One of the most important elements in the regulatory process is the determination of a fair rate of return. Until recently, the history of utility regulation shows that evidence on fair rate of return was usually offered in the form of "expert" opinions which were generally not supported by documentary, statistical, or economic studies. There was more quantity than quality in such evidence, and a large part of the hearings in rate cases were devoted to fair rate of return.

The Commission instructed its staff to conduct exhaustive and continuing research in the matter of fair rate of return, and its conclusions appear to meet the tests to which they have been put. I say this because a tribute to the comprehensiveness, accuracy and fairness of those conclusions is found in the fact that in two recent large gas rate cases before the Commission neither company offered evidence on the subject of rate of return and the only evidence of record is that offered by the Commission's staff. There is no difference in our formula for gas or electric utility rate of return.

In passing, I should like to say that I have long advocated the practice which has been generally pursued by the Commission of giving the same rate of return to all companies similarly situated because it seems to me that it is the only practical method of granting a reward for prudent financing.

Because the period that lies ahead may bring important adjustments to the electric and gas utility industries, as well as industry generally, the

Commission intends to continue its serious study of the problems of fair rate of return under changing economic conditions with the aim of obtaining, as objectively and scientifically as possible, rates of return which are fair to the utility and its investors on the one hand, and to the public and the rate payers on the other.

Statistical Program

Another accomplishment of primary importance to the electric utility industry, I believe, has been the development of the Commission's statistical program. The Federal Power Act of 1935 gave the Commission exceptionally broad authority to secure information regarding all aspects of the generation, transmission, distribution, and sale of electric energy, however produced, throughout the United States and its possessions, whether or not otherwise subject to the jurisdiction of the Commission, and including the operations of any agency of the United States or of any State, or municipality, or political subdivision of a State. We have, however, administered this broad authority with proper regard for the man-power and other problems of industry during the war period. The parts of this program not considered essential during the war period were suspended immediately after Pearl Harbor.

Our annual publication of electric rates in the form of typical electric bills has not been suspended during the war period, but the compilation has been radically curtailed in coverage and volume.

When this survey was first published in 1934, it revealed wide discrepancies in communities similarly situated not only as regards the level of rates but also the form in which rate schedules were presented to the public. The mere publication of these discrepancies throughout the past ten years, entirely independent of any regulatory or coercive actions, has had far reaching effects. Many of the "out-of-line" utilities on a comparative basis have revised their rates, and as a result we have today a far sounder and more equitable rate structure throughout the United States than previously existed.

By early autumn we expect to publish our eighth consecutive edition of "Statistics of Electric Utilities in the United States." This compilation, in my opinion, is the most useful tool we publish for the electric utility industry and, from correspondence we have received, is being increasingly used as an effective yard-stick for the measurement of operations and management practices. Through its use, a large number of utilities have been able to effect substantial reductions in costs which were out-of-line and have materially improved their financial position.

Some reference should also be made to the Commission's "National Electric Rate Book." Keeping our Rate Book completely current has not been possible during the war period. We are reasonably current, however, and will be completely soon after V-J Day.

Comment, I believe, is also warranted with respect to our publication of statistics on the capacity of generating plants and electric power production. The basic data on power supply we report monthly was first compiled by the Geological Survey of the Department of the Interior in 1920 as a result of the dearth of information on the subject revealed during World War I. During recent years we have expanded the series to include data on electric generation by industrial establishments for their own use as well as generation by electric utilities. These compilations provide a constantly current picture of America's power resources, and have been of great value in keeping up-to-date following the inventory made through the pioneering National Power Survey we conducted in 1933-36.

Rate Making Theories

Much has been written about the rate-making theories and policies of the Commission. There is no doubt that ten years ago, as a result of the regulatory practices built up in an attempt to conform with the Supreme Court's decision in *Smyth vs. Ames* and other leading cases, thoughtful students seriously questioned whether it was possible through regulation to secure sound results in the public interest. Regulatory commissions were then required not only to subject themselves to the tedious processes of determining reproduction costs, which were out-of-date before they could be ascertained, but were also tied down to other requirements, such as the observance of physical depreciation. This made it impossible for them to function in the public interest, and cases dragged through the courts for years with results that seldom brought any relief to the consumer.

Congress clearly recognized these infirmities in its passage of the Federal Water Power Act of 1920 by definitely providing that "actual legitimate investment" should be the standard not only for the recapture of licensed hydro projects but also for rate making. This standard was then incorporated in the Federal Power Act of 1935, which provided for the uniform regulation of the accounts, security issues and facility transactions of all electric utility companies engaged in interstate commerce. We have applied the "actual legitimate investment" method of rate-making in each of our rate cases since that time and, as everyone knows, have been repeatedly sustained by the Supreme Court. I believe that the transformation of rate-making from a "guesstimating" to a factual basis is one of the Commission's major accomplishments.

I have outlined some of the things the Commission has done which I consider to be major accomplishments. There are others I could outline if time and space permitted and I could also enumerate the many tasks which lie before us.

Cooperation

As I said before, the Commission was created to enforce the law, and in doing so we welcome the cooperation of the industry.

We would like the recognition by all of the electric utility industry that regulation will work, and we would like the industry universally to approach its regulatory problems with the cards face up on the table. I sincerely believe that, in general, more can be accomplished through this approach than through litigation, but I also believe that there are distinct advantages in court tests in those cases which involve broad statutory interpretation. The electric utility industry is one of America's greatest economic forces. In dealing with its problems under our statutory authority, the Commission wishes to perform its functions without fear or favor and in the best interests of all concerned.

Transmission Line Conductor Reinforcement—II*

Fatigue life of vibrating conductor may be appreciably extended by application of multiple wire ties in conjunction with application of preformed armor—Designs evaluated for resistance to vibration

*F. F. PETERSON** and J. C. LITTLE†, American Steel & Wire Co., Cleveland, Ohio*

DYNAMIC STRESSING of overhead conductors is seldom devoid of the complex effects of such stress concentrators as poorly designed supporting means, abraded conductor cross sections, mass concentrations on the conductor, (e.g., hot line clamps, splices, etc.), wire surfaces damaged by electrical and/or chemical action.

Many designs aimed at minimizing the effects of the above-mentioned phenomena in conductors have been submitted from time to time for the purpose of evaluating their resistance to vibration. To contribute toward that end a type of testing equipment (Fig. 1) has been developed which consists of a rigid steel frame supported on helical springs for vibration isolation, upon which are mounted four movable tables which may be secured to the frame at any point. A means of fastening a length of conductor under a predetermined tension to the frame is provided by the loading lever shown at the left. Attached to the center of a conductor is a lightweight clamp which serves to connect the conductor with the driving coil of the electromagnetic vibrator shown at the center of the frame.

The natural frequency or harmonic of the system is found by exciting the drive motor from the continuously variable oscillator shown at the left, the signal of which is amplified by the amplifier shown at the center. When the desired resonant frequency is obtained, a voltage at that frequency is picked up from independent windings on the driving coil, fed back into the amplifier circuit producing a regenerative vibrating system. The vibration amplitude can be controlled very closely and made to remain constant throughout a particular test. Amplitude measurements are made by means of a cathetometer, calibrated in one-thousandths of an inch and shown in use in the right background. When failure occurs anywhere in the vibrating system, the frequency and/or amplitude will diminish, actuating a sensitive shut-off

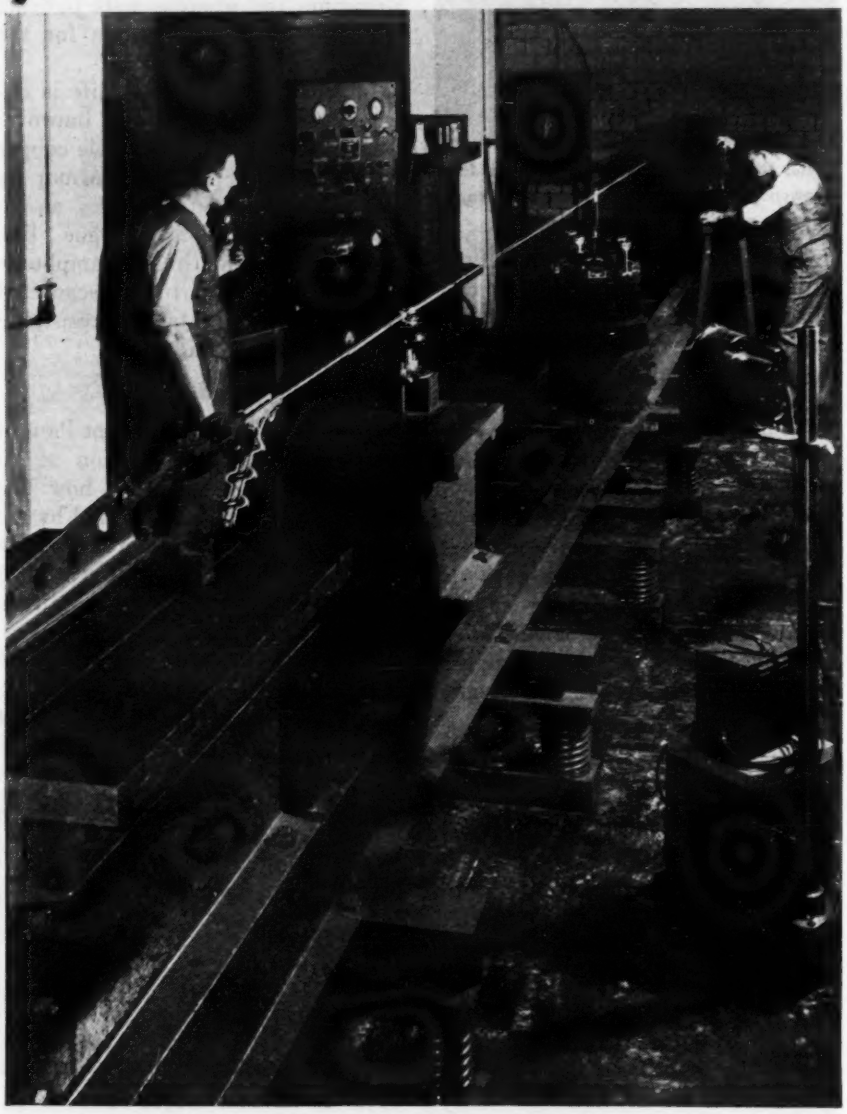


FIG. 1—Vibration fatigue testing equipment for conductors

* Part I, ELECTRICAL WORLD, June 9, 1945.
** Manager, Electric Sales Division.
† Technical Engineer, in charge of Vibration Fatigue Laboratory.

circuit. The total number of cycles for each test is calculated from the readings of a time clock which is an integral part of the equipment. As an aid to observing various modes of vibration, as well as the action between component parts, a portable stroboscopic light is employed such as shown in the right foreground.

Multiple Wire Ties

The multiple wire tie developed through extensive use of this equipment is shown in Fig. 2. The tie shown was a development resulting from a large number of individual vibration fatigue tests made on simple ties in common usage as well as the more complex and less popular ties, during which the merits and faults of each were studied carefully.

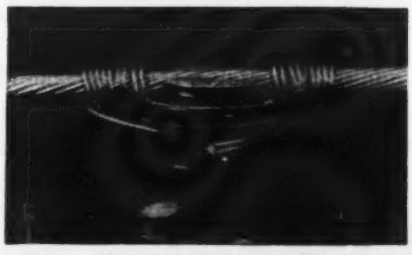


FIG. 2—Three-piece tie developed for use on preformed armor to give conductor added protection

In order to overcome the effects of direct contact of a tie with the conductor it became evident that complete conductor coverage should be employed. This requirement was met by the use of preformed armor.

A further fault contributing to much of conductor abrasion against the insulator groove is the inability of most ties to hold the conductor tightly against the groove, a shortcoming which was remedied by the use of the final twist of tie wire ends around the insulator neck, very effectively drawing a conductor tightly against the groove. Such a tie combination, because of the preformed armor, has very low stress gradients. In addition, the benefit of gradual stress relief by the employment of four points of tie support on either side of the insulator is apparent.

Number of vibration cycles for conductor failure vs. amplitude of resonant vibration of No. 4 A.C.S.R., as obtained on the equipment previously described is shown in Fig. 3. Some obvious merits of the tieing system just referred to are clearly shown by comparing the life of the same conductor at any given vibration amplitude, first using the common armor rods, and second, the PFT armor tie. Interpreted in terms of line vibration in the field, this means that the improved tieing system should enable a conductor to yield longer service life at any given vibration amplitude, more especially at severe amplitudes. For instance, at an amplitude of 0.6 of an inch we might expect approximately one million cycles for conductor failure using the standard aluminum tie, whereas tests indicate a life of ten million cycles for the PFT armor tie.

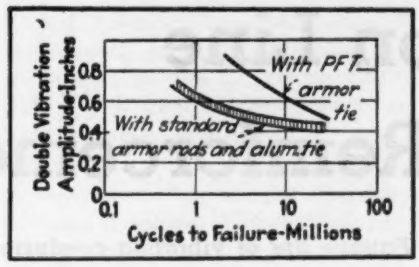


FIG. 3—Vibration fatigue curves for No. 4 ACSR conductor

Improvement of fatigue life is obtained (Fig. 4) where an improvement over the ordinary simple copper tie was sought. The PFT armor tie combination shown produces an almost infinitely long fatigue life, especially at the higher amplitude values. This is partially because of the inherently low fatigue resistance of copper clad conductors.

Amplitude

The end loop and adjacent loop of a conductor under vibration at 80 c.p.s., illustrate (Fig. 5) how the vibration amplitude is affected by the application of the armor tie. The stresses at critical points, such as at insulators, increases as the amplitude of vibration at that point increases. Therefore, we might expect that where a tie system tends to reduce the amplitude at a critical point, the result would be consequent increase in conductor fatigue life. This trend can be shown more clearly by observing a plot of amplitude vs. distance from the insulator for at least two loops.

Such data plotted to a greatly magnified scale (Fig. 6) indicates that the vibration amplitude of a conductor having no armor or no tie of any kind is essentially constant from loop to loop, and, that by adding only a simple tie to the conductor, a barely perceptible amount of decrease in amplitude occurs at the insulator loop. Similar data plotted for the aluminum armor rod and tie construction indicate a considerable decrease in amplitude for the first loop, while the data obtained from the PFT armor indicate a further reduction in amplitude at the second loop, which means that more input energy was required in the cases where high damping was present.

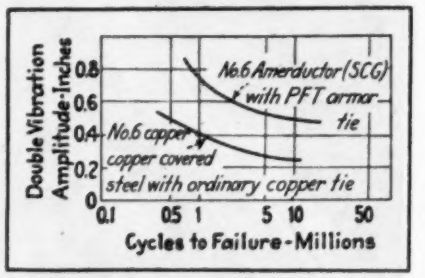


FIG. 4—Vibration fatigue curves of 3-wire conductors, copper and Amerductor

Damping

For testing damping capacity, or rate of decay of vibration the same vibration equipment previously described was used, in conjunction with suitable control devices and an oscillograph for recording the curves.

Among typical decay curves obtained (Fig. 7) the bottom curve (A) shows a decay characteristic of the conductor contacting the insulator,

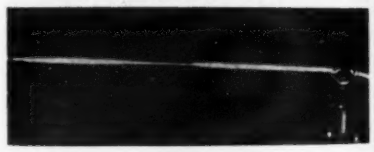


FIG. 5—Section of conductor under vibration showing reduction of amplitude where preformed armor is used

but with no reinforcing or tie, of any kind. The decay characteristic in this case includes all of the inherent mechanical as well as electrical damping of the vibrating system. This curve may be considered as a basis of comparison for the subsequent curves.

Curve B shows the effect of the use of a simple aluminum tie without the aid of any reinforcement. It will be noted that there is very little difference in decay characteristic between this and the former curve, indicating that this tie alone has very little to do with the damping characteristic.

Curve C shows the decay characteristics of the same conductor, having applied to it a conventional set of aluminum armor rods and tied with an aluminum tie. The rate of energy dissipation in this case is consider-

ly greater than that of the two preding curves.

Finally, Curve D represents the decay characteristics of the PFT armor, and it can be observed that the initial rate of energy dissipation is greater than the previous curves, indicating that the greatest damping value can be obtained from this type of reinforcement at greater amplitudes of vibration.

Rates of energy dissipation obtained from the foregoing decay curves are shown in Fig. 8. The logarithmic decrements for a number of decay cycles were calculated from each film, and the resulting damping factors for the construction tested were plotted. Observe again that the damping factor for the conductor

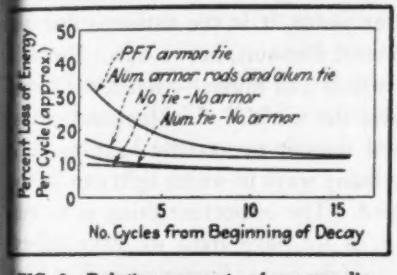


FIG. 8—Relative amounts of energy dissipation determined from decay curves

having no tie or no armor is virtually constant throughout the initial decay time and only a slight increase in initial damping exists. It becomes obvious, however, that with the application of aluminum armor and tie the rate of energy dissipation is noticeably increased. A further increase of energy dissipation within the initial region is observed from the data on the PFT armor tie. It can be seen that the curves tend to converge as the amplitude of vibration drops to a minimum, further evidence that the greatest amount of benefit in vibration can be obtained from reinforcing armor at greater amplitudes.

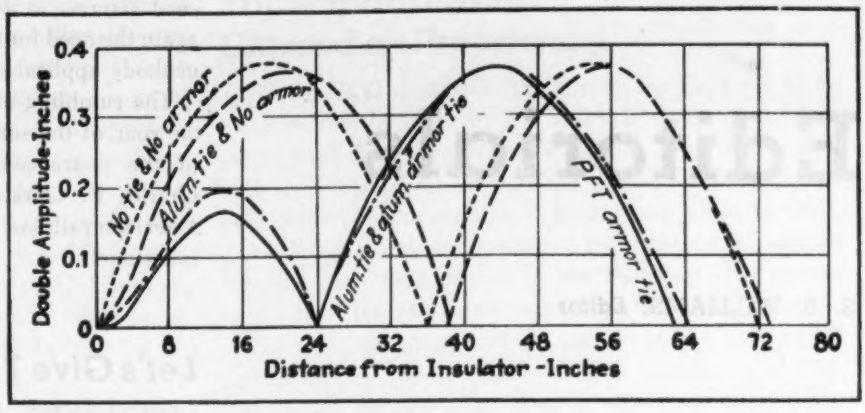


FIG. 6—Reduction of effective vibration amplitude at the critical insulator loop—Amplitudes plotted as function of distance from insulator

Preformed reinforcing is readily adaptable for use on single conductor telephone lines as well as on multiple-wire stranded conductors for power transmission.

Note (Fig 9-a) how the conductor in a common type of telephone tie is unprotected at the point of tangency with the insulator groove and also that there is considerable chance for the tie to be loosened under vibration because the ends are unsecured. Preformed reinforcing may be applied (Fig. 9-b) to remedy such faults. There are no insulator-line contacts, but all contact takes place at the preformed reinforcing. Therefore, when conductor vibration takes place, the resulting chafing and abrasion will be borne by the reinforcements rather than the conductor. As an additional safeguard against the mal-effects of vibration, the tie wires are brought around the insulator neck and tightly twisted, drawing the reinforced conductor against the insulator neck with sufficient pressure to minimize the motion between the components under vibration.

Vibration tests have been conducted up to 40 million cycles on each of the ties just described. Where the common horseshoe tie was used the wire cross-section was badly abraded at the point of tangency with the insulator as well as a certain amount of wear being visible at the point where the tie wires were spiraled out. Improved tie bearing preformed reinforcing after vibration under identical conditions showed contact abrasion on the preformed reinforcing almost invisible. This result can be attributed to the firmness and tightness of the completed tie effected by twisting the tie wire on the insulator neck.

Criticisms centering around the apparent complexity of such a tie sys-

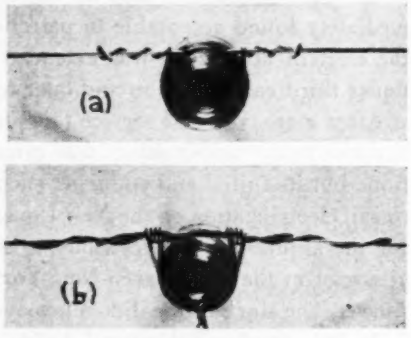


FIG. 9—Telephone insulator ties: (a) Common type which permits conductor to chafe against insulator groove; (b) Preformed armor prevents chafing

tem are to be expected from some sources. However, considering the relative inability of all but the armor type of pin insulator tie to meet satisfactory vibration performance requirements, the question becomes reduced to choosing an armor tie of one type or another. All other armor ties require either specialized tools, high skill to apply them, long lengths of tie wires very inconvenient to handle, or are of such complicated design that the average lineman has difficulty to master them.

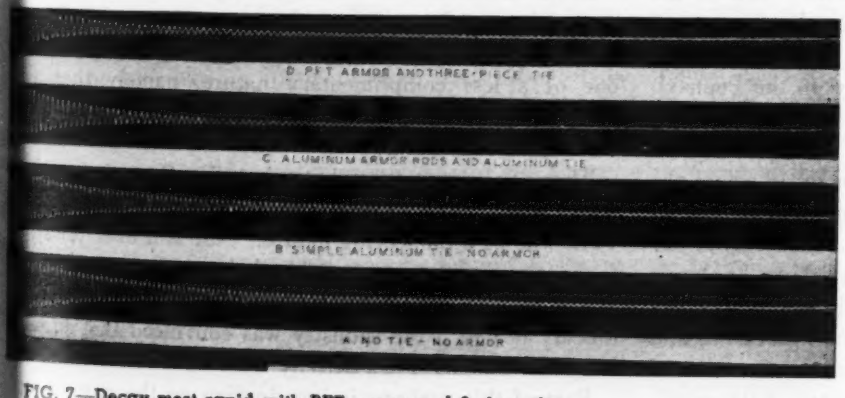


FIG. 7—Decay most rapid with PFT armor and 3-piece tie

Editorials

S. B. WILLIAMS, *Editor*

Fifty Years of Rail Electrification

ON JUNE 28, 1895 a 7-mile stretch of the Atlantic Coast outside Boston Harbor was the scene of an exciting development. Between Pemberton and Nantasket Junction the New York, New Haven & Hartford Railroad replaced its steam service with electric train operation, thus providing the public with the first example of standard railroad electrification in this country. Energy was supplied to motor-trailer trains at 600 volts d.c. from an overhead trolley system fed from a steam plant hard by Nantasket Beach. The speed, acceleration, cleanliness and comfort of the open bench cars used on this scenic route were immediately found acceptable to patrons, and the next year the electrification zone was extended to East Weymouth under third rail operation and later to Braintree.

After many years of service this pioneer line, mainly a summer resort undertaking, was given up for bus operation; but its initial and enduring success gave an impetus to rail electrification on the New Haven and paved the way for the application of electricity to such heavy transport as is met in the New Haven-New York service of modern times. The story of the difficulties overcome at Nantasket in trolley wheel and third rail design, in the improvement of insulation in the overhead system, and in operation generally cannot be recounted here; but high credit belongs to the engineers of the manufacturers and of the railroad for patient pioneer work under the then novel conditions encountered.

Other electrifications followed quickly on the Pennsylvania system and elsewhere, and today such service has long been performing admirably in the metropolitan and suburban fields, as well as in mountain areas where the conditions have warranted the adoption of this type of equipment. Main line service on the Pennsylvania between New York, Washington and Harrisburg has gone far beyond suburban territory, illustrating the scope and flexibility of electrification under proper engineering and economic conditions. Recent improvements in railroad motive power, both steam and diesel-electric, have quickened interest in future developments, emphasizing once again the need for the most advanced engineering study of methods applicable to post-war requirements.

The rumbling of trolley trains no longer mingles with the roar of the surf off Nantasket and Hull, but the echo of the courageous experiment of the then president, Charles P. Clark, and his associates sounds afresh as American railroad electrification passes its semi-centennial milestone.

Let's Give Them Light

CLEVELAND is raising money for a soldier's and sailor's memorial fountain to be lighted in many colors. The idea of using light as a memorial to those who gave their lives in this war is especially appropriate and it is hoped the idea might spread.

If there is one thing that typifies this war and will be remembered long after peace, it is the darkness that accompanied it—black-outs, dim-outs, brown-outs. People's feelings were put to words and music—"When the lights come on again, all over the world." Lights meant peace.

A lighted memorial doesn't necessarily have to be a fountain. There are many ways in which light can be the main symbolic element. The important thing is to emphasize that so long as we have light we have safety, happiness, opportunity, freedom. A great price has been paid to preserve these basic elements of American democracy. A memorial should help us never to forget, not that they gave their lives, but what they gave their lives for. Light more than anything else symbolized these things during the war. The men were fighting that the light might burn. Let's give them light.

FPC Needs Better Industry Relations

THIS WEEK the Federal Power Commission is starting on its second quarter of a century of regulation of the electric power industry. Elsewhere in the issue will be found a review of the principal achievements of this agency as viewed by the chairman of the Commission.

If the achievements of the Commission had been reviewed by members of the industry or any one of several state commissions, it is possible they might have added one of a less complimentary nature, namely that the Commission had succeeded in stirring up a lot of ill will for itself.

There is no question but what the Commission has had a difficult job to do and particularly as much of its work was of a pioneering nature. Nor is it ever possible to restrict earning power without leaving someone with a hurt feeling. Such hurts, however, would have been quickly healed if the industry was convinced that underlying the Commission's activity were no ulterior motives.

Part of this perhaps is imagination on the part of the

dustry because it has been kicked around by federal ncies so much that it views all their acts with suspicion. the other hand, members of a quasi-judicial body not arouse public feeling against those they are regu-ng, or leave the impression that cases are pre-judged, permit examiners to oppose introduction of evidence hout gradually losing the industry's respect.

That a federal commission is necessary to handle util-regulation that is beyond the powers of the state com-sions must in all good sense be accepted. Likewise, should be axiomatic that a strong federal commission rking with the utility industry should be able to be great good for the country as a whole.

So long as the Commission appeared to reflect the anti-vate power attitude of the New Deal Administration, was doubtful if much could be accomplished in the rection of cooperation. With a new Administration and th a chairman who has refrained from taking sides litically on the power question, the beginning of the cond twenty-five years might be a good time to start proving the industry relations of the Commission. e industry has a tremendous post-war job to do. It uld stand a lot of peace and sympathetic encourage-ent.

Condensation and Ventilation

ANY PIECES of electrical equipment are placed where ey are subject to variations in external and internal mperatures. When the spread between the two is ppreciable, there is likelihood, if not certainty, that air ill circulate into and through the equipment. It will ring its moisture along with it and usually some of that oisture will be left behind, to invade the insulation for ne thing and to rust the corrodible parts for another.

Transformers have been provided with sealed enclos-res and other major equipments have breathers designed exclude most of the moisture. But many a control able run is open at both ends; metering and protective quipments have orifices where moisture can enter and eave; dry-type rectifiers have been known to "sweat" nd run into difficulties. And so on.

There are two principal remedies. One is to seal the pertures. Where that cannot be done or justified, the lternative is to provide circulation of air with heat. irculation is the opposite of sealing but it may be ecessary in order to dissipate heat, and, when it is ecessary, it is desirable to add auxiliary heat to help ontrol the relative humidity. How much circulation and ow much heat? More of one and less of the other?

Answers to those questions suggest that electrical engi-eers would do well to study air-borne moisture, humidity nd hygrometry, heating and ventilating principles as hey have studied submersion and exposure to liquid ater. The gain will come in reduced failure of elec-rical windings and less corrosion of structures and nclosures.

Municipal Utilities Classed as Proprietary

TWO RECENT DECISIONS, one by the Supreme Court of Ohio and the other by the Supreme Court of Indiana, place publicly owned utilities in the proprietary class with respect to taxes. In Indiana, municipal utilities were held subject to the state gross income tax while, in Ohio, a municipal traction corporation by engaging in business for profit was held to take on the character of a private corporation thereby forfeiting its immunity from taxation.

The Ohio decision further pointed out that the reasons for exempting public property from taxation are, first, that public money from taxes is used to purchase and maintain the property and, second, that the product of the expenditure of tax money should not be made the subject of another tax. In this particular case the traction system was not purchased with public funds but with bonds that were a lien on the property but not on the city.

It has generally been assumed that publicly owned utilities were automatically tax-exempt and in some states wide exemption does apply. However, the extension of public ownership has grown so in the last two decades that new thinking is becoming more and more necessary. While no one can question a city's right to engage in proprietary enterprises, there is a growing feeling that those who enjoy a service should pay all the costs and not push part of them back on the general tax-paying public.

It is amazing how many ways municipalities are engaging in private business for profit. In addition to the utilities of light, gas, water and transportation, there are public housing, swimming pools, auditoriums, golf courses, airports, gasoline stations, cemeteries, markets, wharves and others. These provide services some times for the few and in no case of equal amount for all. If the customers are to pay any charge, they should pay all charges. The court in the Ohio case expressed it this way, "If this property (Cleveland transit) is held to be tax-exempt, the loss of revenue to the county and the city school district will be transferred to the backs of the general tax-payers; on the other hand, if the property is held taxable, those who use the transit system will be required to bear the tax burden."

As we have pointed out in these columns before, tax discrimination is not between public properties and private properties but between users and taxpayers. There is no discrimination when the functions are purely governmental, such as the courts, fire protection, etc., although all might not use, but when the activities are for sale at a profit then those who wish to use should pay all the costs.

While both the Ohio and Indiana decisions are local, being based upon an interpretation of state law, they represent the kind of thinking that can be expected to grow as further efforts are made to remove property from the tax rolls. Right now taxes offer an attractive incentive to public ownership. If these decisions were to apply broadly, public power agitators would be deprived of their biggest asset.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

German Industrial and Power Disarmament

SCATTERED BITS of information are seeping through the veil of censorship which has blacked out the Allied policy of dealing with Germany's industrial machine.

So tight has been the censorship that it has not been permissible even to mention the names of the various committees which have been organized to do specific jobs in connection with Germany's industrial disarmament and the ferreting out of Germany's industrial secret weapons.

But, with the recent stories of a press conference held in Paris by Edwin Pauley, personal representative of President Truman on the Allied Reparations Commission, some discussion of the problem, the U. S. position regarding it, and the prospective solution of it becomes possible.

Payment in Kind

Pauley told the press that the United States view is that any German industries of a war nature which can not be removed should be destroyed. The object, of course, is one which has not been a secret for a long time—that of so restricting the German industrial machine that it will not again be able to supply another Prussian war machine. The late President Roosevelt made it clear that Germany's conquerors would seek reparations in kind, not in money. It was emphasized that ravaged countries would seek, say, freight cars for freight cars, rather than francs, pounds sterling or rubles for freight cars.

The question then arose as to whether the reparations in kind to be exacted from Germany would be existing equipment available at the time of occupation or new equipment.

In a broad, unspecific way, the question seems to have been answered by Pauley's Paris statement that our first aim is to reduce German industry to a point below which it could support war, and by his added comment that this policy would prohibit the rehabilitation of German industry to a point at which it could manufacture enough to pay off sizable portions of its reparations bill after contributing to the German standard of living, whatever it is to be, that will prevail post-war.

"We do not want another war to take place," Mr. Pauley is quoted as having told his press conference, "and we are anxious to see that type of equipment taken out of Germany, even though we don't want it ourselves."

Thus the twin policies—reduction of Germany's war-making potential and reparations in kind—state plainly that substantial capital equipment which helped power the Wehrmacht will, in the not-too-distant future, be helping raise the living standards in Smolensk, Amsterdam, Liege or Lyons. The Germans, as far as can be made out, will have to content themselves for years to come with a light industry that will employ people but not build armies.

Power Industry

Thus arises the question of what is to happen to Germany's electric power industry. This question becomes doubly interesting because of the fact that in Germany, as throughout Europe generally, much of the generating capacity is of industrial nature rather than central station plant. It is logical to expect that the claimant nation which seeks a machine tool plant may want the electrical equipment with which to power it. This might cause some concern in those sections of Germany where industrial power plants also serve local non-industrial load. Aside from the fact that such complaint might be answered satisfactorily enough with a blunt "Who started all this, anyway?", stripping the industries of such an industrialized section as the Ruhr might easily change the nature of the area's electric facilities from industrial to central station plant.

In 1937, Germany had some 10 000,000-kw. of generating capacity according to information available to the public. Beyond any doubt that figure was raised substantially by the Nazis before and during the war—for war purposes. Equally beyond doubt, some German power generating capacity was bombed or otherwise destroyed during the war, leaving today's capacity a matter of conjecture.

Non-Industrial Consumption

According to information available to the public, overall German energy use in 1937, not including industrial consumption, was about 8,500,000,000 kw-hr. Average household use was estimated at something less than 200 kw-hr. yearly by somewhat less than 20,000,000 German families. It is estimated that about 2,500,000,000 kw.-hr. were consumed for domestic purposes, and that another 1,500,000,000 kw.-hr. were consumed by German railways. The remaining 4,500,000,000 kw.-hr. were used for street lighting, water pumping, commercial purposes and the numerous handicraft industries practiced in the Reich.

Assuming a 33.3 percent load factor, the 8,500,000,000 kw.-hr. of non-industrial consumption described above—which it is assumed will be permitted the Germans—could be supplied by 2,900,000 kw. of capacity. Reserves and peaking capacity would be available in this figure.

Germany used 20,000,000,000 kw.-hr. for industrial purposes in 1938, but the figure is too old to have any meaning, even if it were known what types of industry are to be allowed in Germany.

Whatever the amount of capacity left for industrial purposes, that figure, plus the 2,900,000 kw. described above, presumably will be subtracted from the existing capacity.

The difference seems to be available for "export" to countries ravaged by Germany.

NEWS OF THE WEEK

Administration Opposition to Freeing REA Indicated

House Interstate Commerce Committee Ignores Lucas Bill Giving REA Freedom to Consider Poage Bill Which Is Similar But Would Keep Agency Under Agriculture Department—FPC Confirmations Expected

Added indication that the Administration plans to combat legislation divorcing the Rural Electrification Administration from the Agricultural Department was seen last week in the action of the House Interstate Commerce Committee, which held hearings on a bill embodying the provisions of the Lucas Bill, but which makes no provision for REA's independence.

Introduced by W. R. Poage, Texas Democrat, as a companion measure to the Lucas Bill, the legislation authorizes system planning for cooperatives by REA, authorizes $5,000,000 yearly to pay for it, and authorizes $585,000,000 for a three-year post-war loan fund for REA. These were the original provisions of the Lucas Bill, which was amended by the Senate Agriculture Committee to divorce REA and Agriculture. The Lucas Bill passed the Senate without dissenting vote, but has not been considered by the House Interstate Commerce Committee, which chose instead to consider the Poage Bill.

House Speaker Sam Rayburn had told a press conference shortly after the Senate passed the Lucas Bill that legislation containing the REA independence amendment would never pass the House. It appeared that the strategy was to have the House pass the Poage Bill with no provision for independence and then attempt to force it through the Senate without amendment on pain of its rejection by the House if legislation divorcing the two agencies were to be incorporated. If the bill were to reach the Senate floor without an independence provision, supporters of independence for REA would have to risk voting against a huge REA loan authorization to do their cause any good, and it is hard to get members of Congress to vote against REA loan funds.

In commenting on the Poage Bill, Wickard told the committee that if the deficiency legislation seeking $160,000,000 for REA for the next fiscal year were to become law, adjustments in the Poage authorization bill could easily be made. During May, 1945, Wickard said, REA's backlog of applications on hand and in preparation jumped from $140,000,000 to $214,000,000.

With the return from Europe of Chairman B. K. Wheeler, Montana Democrat, of the Senate Interstate Commerce Committee, the nomination of Nelson Lee Smith for a five-year term on the Federal Power Commission was expected to be reported favorably to the Senate this week. It was not expected that hearings would be held or that opposition of any consequence would develop. FPC officials hoped the confirmation would have been made by June 22, when Smith's current appointment to the unexpired term of the late Commissioner Clyde Seavey, expires.

Nothing further had developed early this week on the appointment of a replacement for Commissioner John W. Scott, who resigned recently, but there were indications that an appointment might be made by the end of the week. It was expected that a name bearing endorsement of commission members would go to the White House this week, but there was no indication as to who the commission's nominee might be.

Sen. Lister Hill, Alabama Democrat, introduced recently a bill to amend the Rural Electrification Act to authorize the REA Administrator to make loans for provision or improvement of rural telephone service. Under the bill, REA would be authorized to borrow $50,000,000 yearly from the Reconstruction Finance Corporation for rural telephony and would be appropriated $25,000,000 from the Treasury for fiscal 1946. Loans would be amortizable over 35 years at 1.75 percent interest. REA would be specifically authorized to acquire existing rural telephone systems, and preference would be required for public bodies. Rural areas would be defined as any areas in which the population is not in excess of 10,000 people. Several of these provisions are much less strict than comparable provisions of the REA Act.

•

Utilities Advised to Slow Delivery of Transformers

Director Edward Falck of the Office of War Utilities asked electric utilities this week to review immediately their orders for small distribution transformers in the light of the availability of wood poles and manpower for their installation.

He suggested that delivery dates on transformer orders be adjusted, where necessary, "to conform to the restrictions on ordering material contained in Order U-1."

Falck, in an administrative letter, said the power and distribution transformer industry advisory committee had indicated that "orders for small distribution transformers are being placed by electric utilities specifying deliveries in the aggregate substantially in excess of requirements."

"Although the specific controls of Direction 1 to Order U-1 were revoked May 12," Falck pointed out, "U-1 continues to restrict the scheduling of transformers, as well as of other items used for maintenance, repair and plant additions. It was emphasized in our admin-

istrative letter of June 5 that in general, no material for plant additions should be ordered for delivery on dates earlier or in quantities greater than required for the construction or installation. In particular, small distribution transformers for overhead service extensions should not be ordered for delivery on dates earlier than there is assurance that the poles will be erected for their installation."

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Detroit Edison Gets Stay In P.S.C. Order on Refund

Detroit Edison Co. has been granted an injunction by Judge Archie D. McDonald restraining the Michigan Public Service Commission from enforcing its order to the utility to establish a $10,450,000 fund from its revenues for a possible refund to its 1945 customers.

The rate refund was ordered initially to reduce the company's income to a point where it would not have to pay federal excess profits taxes.

The judge also included in his injunction an amendment permitting the commission to file a new proposed rate schedule, and to make the schedule part of its recent order calling for establishment of the reserve fund. The rate schedule would reduce the company's income by $10,450,000, the estimated excess profits tax liability. The utility is opposing any change in its rate structure.

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Nebraska P.U.D. Workers May Bargain Collectively

Nebraska Legislature at its last session voted to allow public power districts to make collective bargaining agreements with their employees.

Under the law any public power district continues to have the right to employ any individual whether or not such individual belongs to any organized group; collective bargaining is permissible only for those who voluntarily authorized an agent to represent them; each collective bargaining agreement must provide for arbitration for all controversies; and when a district acquires a utility, the directors of the district may continue in whole or in part, collective bargaining agreements between employees and the private owners of the utility in force at the time of acquisition.

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Utility Installing Boiler

Installation of a 140,000-lb. per hour boiler at 450 pounds pressure at the St. John plant of the New Brunswick Power Co. has been started.

Wickard Considered Sure of Senate Confirmation

Cooperative Representatives Furnish Agriculture Committee with Specific Instances in Testifying against Former Agriculture Secretary's Committee Votes 11 to 6 to Approve Him as REA Administrator

Senate action on the nomination of Claude Wickard for administratorship of the Rural Electrification Administration was expected this week and indications were that confirmation would be forthcoming after several hours debate.

On the basis of the 11-6 committee vote, it was expected that confirmation would be accorded by a comfortable majority with the vote splitting essentially along party lines. The nomination had not been considered by the Senate early this week because of the press of other legislation. In committee, Wickard was opposed by six Republicans, while three Republicans joined eight Democrats in favoring the nomination.

After Wickard's nomination was favorably reported by the Agriculture Committee, it was twice passed over on the floor.

Minority Appeals to Senate

Sen. Henrik Shipstead, Minnesota Republican, filed with the Senate a statement of minority views, signed by the six senators who voted against a favorable report of the nomination. The statement declared that "it is clear that the sole reason why REA was to be made an independent agency was to remove it from under the maladministration of Mr. Wickard."

Opposition to Wickard by co-op representatives stiffened as the hearings went into their third session. Witnesses came to the stand armed with "specific instances" which had continually been demanded by Sens. Scott Lucas and Allan Ellender of the first witnesses.

Mrs. Minnie McFarland, of Portland, Ore., told the committee that her co-op liked neither Wickard's past administration of REA nor his stand regarding private utilities in the rural electrification picture. She said a man with the interest of rural electrification at heart would never have made the disputed statement on the basis of which Wickard was termed a private utility man.

Victory Edmund, president of a power and a distribution co-op in Minnesota, attacked Wickard as unqualified and as a political appointee. He said there is real doubt whether REA could carry on a big construction program under Wickard's leadership, since it is so confused now. He declared that policies dictated by Wickard had delayed for several years construction by his own co-op and charged that Wickard had slowed up rural electrification on the one hand while demanding increased food output on the other. His generating co-op notified REA in December, 1943, that it needed capacity and it got priorities in August, 1944, but that because of REA delays, it was unable to get its unit in time to carry the load for which it was planned.

O. J. Grau, of Storm Lake, Iowa, speaking for ten Iowa delegates, told the committee that 50 of 51 Iowa co-ops belonged to the statewide organization which opposed Wickard. He said Wickard never really seemed sold on the necessity for REA, and classified his appointment as a "political reward." It was testified that Iowa co-ops voted 42-2 against Wickard's nomination.

Three witnesses, Wesley Thomas, of Fordsville, Pa., John Hendricks, of West Liberty, Iowa, head of the only Iowa co-op not a member of the Iowa statewide, and G. L. Bridwell, of Cynthiana, Ky., took the stand to favor Wickard's appointment. Bridwell said Kentucky co-ops favored Wickard almost without exception.

George Endicott, manager of an Illinois co-op, told the committee that he opposed Wickard, partially on the basis of the controversy over aluminum and copper conductor which played so large a part in the 1944 REA investigation. He said his co-op had on file telegrams from REA warning that they would get no allotment if they chose aluminum conductor but would get the funds immediately if they chose copper. He said further that confusion among REA personnel was responsible for giving the co-op poor engineering advice and held up several construction jobs.

Former Administrator Harry Slattery took the stand to repeat many of his earlier charges against Wickard's handling of REA.

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Changes Business Place

Brazos River Transmission Electric Cooperative, Inc., has changed its place of business from Itasca to Waco, Texas.

Falck Indicates Changes in Utility War Controls

Director of Office of War Utilities Tells Southeastern Electric Exchange That Utilities Are Likely to Be on Their Own by January 1—Predicts That L-94 Will Be Revoked—Advises on Promotion Activities

Electric utilities will be on their own by the year's end if present War Production Board plans are carried out, Director Edward Falck of the Office of War Utilities told the Southeastern Electric Exchange this week at Atlanta.

Not only the automatic preference ratings assigned by Order U-1 but those assigned construction projects as well stand to be wiped out next January 1 under present thinking, Falck told his audience, adding,

"By that time, I feel sure that the engineering procurement and scheduling of equipment for these projects will be well under way."

Some form of spot assistance will doubtless be available to expedite deliveries in the case of emergency breakdowns, Falck declared, but he urged utilities "to make every effort to accomplish their procurement without requesting special assistance." His speech was considered a complete exposition of the doctrines of those WPB officials who favor the quickest possible discard of controls and return to normal business practice.

Falck indicated that Order L-94, providing for mandatory interconnections and establishing the machinery for energy rationing probably will be revoked reasonably soon, adding:

"It is my opinion that most utility systems will continue to operate their facilities and interchange of power with other utilities so as to achieve the maximum coordination of power supply even after L-94 is revoked."

Interconnections Always Desirable

He warned that when it is revoked, "this act of revocation should not be construed by anyone as an indication that interconnection and power pooling is from that time on no longer necessary or desirable."

"It is my conviction," Falck asserted, "that the utilities of the United States should make every effort to continue to coordinate power supply on a voluntary basis for the indefinite future. But in any case, and whether or not L-94 is revoked, it is in the national interest that this type of coordination continue until the end of the war."

Falck praised the work of the power industry throughout the war with the statement that "a magnificent job has been done." He noted the "method of cooperation which developed during the war between the privately and publicly owned systems in the Southeast and between all of these power systems and the Office of War Utilities." Expressing hope that it would continue long after the war, Falck declared,

"We in this country have a great task before us and we would indeed be foolish if we wasted a considerable portion of our energy and strength in useless political controversies."

Noting numerous war activities which utilities helped promote in their cities, he added:

"I believe that the vigorous and successful participation of utilities in these war activities has greatly strengthened their position and the respect in which they are held by the public."

Predicting that operating costs for material and labor will tend to be higher after the war, Falck gave as his opinion that utilties would be able to continue the "long downward trend of electric rates and at the same time remain solvent only by means of aggressive load promotion." Energy requirements which can best be served by electricity, he said, "could easily be multiplied several fold in the next generation."

The time is coming, Falck went on when it will be "altogether appropriate" for utilities to resume advertising and promotion programs. But he warned against advertising now that new appliances are here, since they are not now being produced in any quantity and will not be for some months.

"For the next term," Falck said, "promotional activity should be related squarely to the war program. Industrial utilization equipment that will increase productivity per worker, reduce accident hazards or result in the saving of material, fuel or transportation is very much in order. In the residential consumer field, programs should be geared to the objectives of saving food and saving labor. . ."

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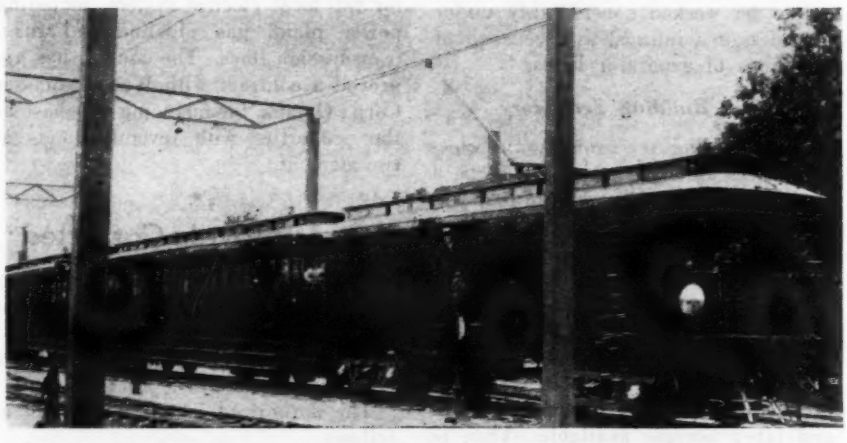
Albuquerque Utility Begins Expansion of Power Plant

Enlargement of its main power plant in Albuquerque as a move preliminary to the installation of an additional steam turbine and generator unit was started recently by Albuquerque Gas & Electric Co.

Arthur Prager, firm president, said the additional unit will add 7,500 kw. to the system's present 19,000-kw. capacity. The system serves several New Mexico towns in addition to Albuquerque. Cost of the new equipment will be about $650,000. Installation will be completed about September 1.



GOLDEN ANNIVERSARY—On June 28, 1895, the New York, New Haven & Hartford became the first electrified railroad in America when trains such as this began running on the 7-mile seacoast line between Pemberton and Nantasket Junction, Mass., adjoining Boston Harbor. Direct current at 600 volts was supplied by overhead trolley, but next year on an extension to East Weymouth, a third rail was pioneered. The Nantasket line has been replaced by bus service, but the experiments here were important in the electrification of steam railroads. The New Haven management and staff officials will commemorate the courage and foresight of the then president, C. P. Clark, and his associates in launching the pioneer line. Today the railroad operates 642 miles of electrified track, using 128 electric locomotives and 198 multiple unit suburban cars.

Fuel Not Bombing Cut English Power

Electric Output Fell Less Than 1% from Enemy Action — Varying Qualities of Coal a Hindrance

At no time during the war was there more than five percent of England's electricity generating capacity out of operation as the result of enemy action. Mostly the capacity reduction from that cause ran below one percent. This evidence of Hitler's conspicuous failure to cripple Britain by interruption of power supply was one of several points touched on in an interview with an ELECTRICAL WORLD editor by Harold Hobson, chairman, and E. R. Wilkinson, commercial manager, of the Central Electricity Board, who recently arrived from London.

Of much more effect in cutting down available capacity were conditions of fuel supply resulting from transportation difficulties, and increasing stringency in the mining industry. Generating plants designed for specific kinds and qualities of coal were forced to operate on any coal that could be had. It was not a matter of changing from the designed fuel to another and running along on the other coal for any appreciable time. Such changes could have been made in most cases with minimum reductions of capacity by revisions of equipment and of operating practices. But this was not the case. Plant operators hardly knew from one day to the next what coal would be available to them. Thus it was that boilers often had to be worked considerably under their designed ratings, with consequent reductions of generator loads.

Load Building Secondary

Load building, the promotion of electricity uses among customers, will be a matter of secondary concern to Britain's utilities for some years to come. They will be too much occupied with meeting the demands on them to give any thought to ways of making those demands larger. As in this country, war production will continue at high levels until the Japs are defeated. Civilian production will increase as materials and labor become available. Thus no immediate large decrease in industrial load is anticipated. Provision of housing for bombed-out people and restoration of business premises will take the nation's output of electrical goods and materials without any great amount of selling being necessary.

Additions to utility plant since 1939 have been held to a rigorous minimum so that at present total generating capacity of the country is probably only about 85 percent of what it should be for operation entirely safe from dangers of significant outages of service. Thus the first concern is to build new plants and other system facilities, to extend and strengthen existing facilities and to catch up on maintenance deferred much too long.

WAR LOAN PARADE FLOAT—Flying the flags of the United Nations, this float of the Duquesne Light Co. was one of the bright spots in the parade held in Pittsburgh to open the Seventh War Loan Drive

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Nebraska City Proposes to Organize Municipal

Nebraska City, Neb., will call a special election soon for a vote on a tentative agreement of the city to pay Consumers Public Power District $873,000 for the local electric system, including power plant, gas pipeline and rural transmission lines. The council has approved a contract with Wachob-Bender Corp., Omaha, for financing purchase of the properties with revenue bonds at two percent.

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Unit Approvals Corrected

Capacity of several generating units listed as approved by the Office of War Utilities in the June 9, issue of ELECTRICAL WORLD, page 116, was listed erroneously.

The authorized installations were as follows:

City of East Palestine, O., a 2,500-kw. unit and a 35,000 lb. per hr. boiler.

City of Glendale, Calif., a 2,000-kw. unit and a 20,000 lb. per hr. boiler.

Federated Cooperative Power Association, 1,500-hp. diesel with auxiliaries, substation and transmission line for its Butler plant, near Allison, Ia., and a 1,020-hp. diesel with auxiliaries, substation and transmission line for its Grundy plant, near Dinsdale, Ia.

Holding Company Act Affects Many Utilities

How the Public Utility Holding Company Act of 1935 is affecting such companies controlling electric utilities is brought out in the tenth annual report of the Securities and Exchange Commission.

In the period from December 1, 1935 to June 30, 1944, 82 companies have been divested and are no longer subject to the provisions of the act. Eight of these with assets of $649,000,000 were divested by exchange or distribution of securities to security holders and 74 with assets of $845,000,000 were divested by sale of property or securities.

An additional 23 companies are still subject to the act despite divestment. Five of these with assets of $1,285,000,000 were divested by exchange or distribution of securities to security holders, and 18 with assets of $178,000,000 were divested by sale of properties or securities.

By partial sales of properties, 42 subsidiary companies divested themselves of assets of $73,000,000 which are no longer subject to the act, and 8 others divested themselves of $1,000,000 in assets which are still subject to the act.

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Canada Frees Copper

Restrictions on the use of copper and other non-ferrous metals for rural electrification or other public utility services have been removed, the Munitions Department of Canada has announced. Utilities may now purchase these metals without a permit.

Market Survey Released by Consolidated Edison

Comprehensive Study of Economic Life and Living and Buying Habits of New Yorkers Designed to Aid All Business and Indirectly Build Post-War Load—63 Charts, 83 Tables, 87 Maps Used in Presenting Data

To help its customers promote their own business and in this way build its own post-war load, Consolidated Edison Co. this week released the first copies of its "Survey of the New York City Market."

The survey, a comprehensive study of the economic life and the living and buying habits of New Yorkers in the four boroughs which the utility serves, has been published in a 124-page book with pages 12 by 18 inches. The book contains 63 charts, 83 tables, and 87 maps.

At the meeting where it was shown to the press, it was stated that the survey was prepared to help every business with a product to sell or a service to render in New York City. "It is for the use of department stores and those dealers merchandising electric and gas appliances, as well as retail stores, chain stores, banks, real estate firms, insurance companies, manufacturers, newspapers, advertising agencies, and utilities. It can be used as a foundation for market analysis to determine the location and degree of buying power, outline sales territories, set sales quotas, check sales efforts, allocate advertising expenditures, and to locate stores or other types of businesses."

Used to Plan Extensions

The survey was prepared by the Bureau of Economic Research of the Consolidated Edison Co., and much of the information was compiled in connection with the company's studies of the make-up and development of the city for use in planning future requirements of electricity, gas, and steam.

The data, organized and presented in graphic form, were obtained from various sources including the United States Census of 1940 and local agencies. The four boroughs served by the company are Manhattan, Brooklyn, Bronx, and Queens. In most cases, the data are presented by census tracts, the unit used by the Census Bureau.

For easy use, the book has been divided into five sections. A summary and general section which summarizes the detailed information given by boroughs together with transportation maps makes up the first section. Each borough is treated separately in the four succeeding sections. Each borough section is also subdivided into table and chart pages giving the overall borough picture and the census tract map pages which show the geographic distribution over the borough.

Particular emphasis in the survey has been placed on housing because the type of dwelling in which a family lives determines many of its most important expenditures. The dwelling not only gives an indication of family income, but it also shows what space is available for equipment and appliances. It is pointed out that apartments are generally not as spacious as one and two-family dwellings and therefore can accommodate less furniture, less lighting, and so on.

For each of the 3,343 census tracts in the four boroughs of the city surveyed, the book gives the number of residential structures, the number of dwelling units, the number of one and two-family houses, the number of owner-occupied homes, the number of dwelling units built before 1900, the number needing major repairs, the type of heating and the fuel used, and the number of mechanical refrigerators.

The number and location of the following six types of stores are given for each of the four boroughs: food stores, eating places, wearing apparel, general merchandise, drug stores, and home furnishings.

Four separate colored maps are issued with the survey, giving the average monthly rent for each of the 4,000 city blocks in the four boroughs.

Paper Is Ammunition

Paper is scarce today because over 700,000 different war items are wrapped, labeled or made from paper or container board. The war in the Pacific increases the demand because products going to that area require double and triple packing for protection against weather and insects.

So share your ELECTRICAL WORLD; the number of copies is limited.

Keep in operation in your office and plant a continuous drive to collect all waste paper for salvage. Contribute your dead correspondence, obsolete records, useless display material, and unusable cartons.

Hetch Hetchy Contest May End in Courts

Constant Support by Ickes of Raker Act Leads Third Parties to Favor San Francisco Plan

Prospects that the protracted wrangle between Secretary of the Interior Harold L. Ickes, and San Francisco's city fathers over terms of Hetch Hetchy power sale would end in a mutually satisfactory contract in the near future diminished in mid-June. To all appearances, more bitter court clashes were in store—Mr. Ickes armed with his unyielding Raker Act, and San Francisco fighting to retain coveted Hetch Hetchy Power revenues.

Though city officials apparently were making every effort to adjust their latest sales contracts to revisions demanded by Mr. Ickes, third parties were rising in opposition to demands of the Interior Department—action which hatched the belief the city may ask Federal District court approval of the new Hetch Hetchy disposal plan over the Secretary's objections.

No Hetchy Power For Utility

In the latest plan, which includes a nine-year contract to supply power to Modesto and Turlock irrigation districts, Mr. Ickes insists that none of the Hetch Hetchy power sold to the districts be resold to the Pacific Gas & Electric Co., and that the districts not increase sales of their own power to the P. G. & E. over 1944 levels.

To the first demand which involves the Raker Act, the districts accede, but they remain adamant in their resolve not "to submit to the arbitrary dictum of the Secretary of the Interior in limiting the operations of (their own) Don Pedro Power Plant . . ." The districts have generated power at the Don Pedro Project for 20 years and have sold surplus to the private utility, amount of which supposedly would increase with Hetch Hetchy power supplying the districts' needs.

Further, Mr. Ickes said "No" to the nine-year life of the present plan on grounds it would not conform to the Raker Act after 1950.

Reason is that contracts to supply Hetch Hetchy power to Kaiser's Permanente Metals and Cement Plants at Los Altos are of five-year duration. With their termination. the small amount of "dump" power that previously would have been sold to the P. G. & E. would be greatly increased —with the city's revenues from dump power rising to $423,000 in 1950 from $24,000 in 1949.

Currently San Francisco is realizing

$2,400,000 annually from sale of the entire Hetch Hetchy output to P. G. & E., a sale which does not comply with the Raker Act under which the city constructed Hetch Hetchy Dam on government lands. The new contracts, as they stand, will mean a loss of over $1,800,000 revenue during the nine-year period.

Meanwhile, the July 2 effective date of an injunction barring sale of Hetch Hetchy power to P. G. & E. was fast approaching without a satisfactory sale solution in sight.

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Demand for Free Street Lighting Growing in Ohio

During the depression years, 1932 to 1936, the Ohio Public Service Co. furnished free street lighting in many cities. Today, when the company must negotiate for the renewal of rate ordinances, it finds that the cities are now demanding free street lighting in addition to rate reductions for both residential and commercial users.

Warren was given free street lighting early in June when an ordinance was renewed for two years retroactive to November, 1944; savings to Warren for the period will be $75,000.

Lorain officials are already voicing demands for free street lighting; the rate ordinance will be up for passage in July.

Ohio Edison Co. is facing similar demands in Girard, Akron, and Youngstown.

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New Turbine Installation Planned by Jersey Utility

Engineering studies are under way on the installation of a 100,000-kw., hydrogen-cooled, turbine-generator and a 900,000 pound per hour boiler at the Essex Station of the Public Service Electric & Gas Co. at Newark, N. J.

The cost of the project will be approximately $7,500,000, and the installation will mean a net increase of 77,500 kw., raising the capacity of Essex Station to 320,500 kw.

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Heads New Mexico P.S.C.

W. W. Nichols, oldest member of the New Mexico Public Service Commission in point of service, automatically became commission chairman June 1, replacing C. E. McGinnis, whose term with the state body had expired last January. Appointed by the governor to fill the vacancy is Tom V. Truder of Las Vegas, formerly consumer's counsel under the 1941 Utility Act.

P.E.A. Meeting Leads to Relay Tube Study

Tubes for carrier relaying are headed for a period of intensive study and development as a result of a two-day session of the Pennsylvania Electric Association's communications committee in Newark on June 14 and 15. One whole day was spent at the RCA tube factory at Harrison, and the outcome is a definite move to correlate production and quality-control techniques with the needs of the utility users so that sustained characteristics for longer periods will ensue. E. H. Erickson of the RCA staff will study the replies to a questionnaire to be sent out by the committee; it is aimed at framing the desired maximum percentage of premature failure rate, the desired life expectancy, after compiling the experiences and limitations of prior tubes. The committee was much gratified by the progress achieved in the mutual study and discussion.

An added feature of the program is the ascertainment of tube types on which producer and user can focus. At present the types most used for carrier are 25L6, 25B6, 25A7, 6L6, 6C8G and 807.

One immediate consequence of the joint meeting was the tacit agreement that positive life-endurance of any particular tube cannot be assured by any known test. Another is that there is good prospect for development of a low-voltage, high-output tube. One utility gets pretty good life results by using only tubes which have survived 100 hours in a circuit which simulates actual operating conditions.

Along with the betterment of tubes per se the committee is continuing its drive for simplified-carrier terminals so that carrier relaying can profitably be applied to shorter, lower voltage lines. The status of this program will be published soon.

Discussion of the RTPB allocation for mobile emergency radio led to a decision to call a conference of all involved utilities in the area to resolve choice of frequency within the 25-50 mc band so as to avoid interference. Two-frequency operation is preferred. Some shielding was reported for valley locations of FM mobile units.

Series capacitor on one of two similar 150-kva. seam welders was reported by C. S. Young, Pennsylvania Power & Light Co. to give a 7 db improvement over one not so supplemented.

Hobson Named Head of Arizona Authority

Presaging a drive to bring large quantities of Colorado River hydroelectric power into the state for distribution to cooperatives, municipalities, and private utilities, Arizona's newly created State Power Authority recently appointed J. R. A. Hobson, Jr., director of public utilities for Richmond, Va., as its director.

The Arizona State Power Authority was created at a special session of the state legislature, last year, at the request of Gov. Sidney P. Osborn after a long and bitter fight in which the legislature repeatedly refused to enact the legislation.

The controversy started shortly after completion of Boulder Dam, because 17 percent of Boulder's power output was allocated to Arizona and there was no state agency in existence empowered to receive the power and build transmission lines for distribution within the state.

Under the advice and counsel of the power authority, a number of electric power cooperatives have been organized and about 16 are projected as a means of blanketing the entire state. The co-ops are being organized because the Power Authority lacks legal authority to retail or wholesale power.

A native of Richmond, Mr. Hobson is 43 years old and a graduate electrical engineer of Virginia Military Institute and of Massachusetts Institute of Technology. Prior to becoming director of public utilities for Richmond nine years ago, he served as consulting engineer with Chase & Waring, of New York City, in research work covering combustion of fuels, gas generation and power development. Subsequently, he became administrative project engineer in charge of hydroelectric projects at Danville, Va., and High Point, N. C.

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COPCo Gets Franchise in California City, County

Permission to operate under franchises granted it by the City of Crescent City and the Board of Supervisors of Del Norte County, Calif., has been granted the California Oregon Power Co. by the California Railroad Commission.

Facilities of the Public Utilities California Corp. which serve Crescent City in Del Norte County were purchased by COPCo in April.

In granting authority to operate in Del Norte County, the California Commission stipulated that COPCo may not supply electric service within any portion of the county now being supplied by other public utilities.

Bituminous Coal Stockpile Lowest Since July 1, 1941

The national stockpile of bituminous coal dropped by 1,676,000 tons during April and rested at 43,819,000 tons on May 1, an average of 27 days supply, Solid Fuels Administrator Harold L. Ickes announced recently.

With stocks at their lowest point since July 1, 1941, production also was substantially behind requirements for the calendar year of 1945, Ickes disclosed, with the output as of May 26 totaling 238,970,000 tons, or almost 21,000,000 tons less than the output at a comparable date in 1944.

Stocks held by electric utilities on May 1 totaled 12,377,000 tons, or less than 150,000 tons short of the April 1 total. Average number of days supply remained the same at 63. Electric utility consumption during April totaled 5,909,000, a decrease of 4.5 percent from March consumption. Daily average consumption in April was 196,967 tons, a 1.3 reduction from daily average consumption in March.

Average number of days' supply, by regions, on May 1, was as follows:

New England, 86 days, down two days from April 1; Middle Atlantic, 58 days, up three; Ohio, 47 days, up six; Michigan, 38 days, down nine; Illinois-Indiana, 59 days, down one; Lower Missouri Valley, 66 days, no change; Lake Dock territory, 81 days, up three; Southeast, 83 days, down 11; Southwest, Mountain and Pacific, 140 days, up 34; total all regions, 63 days, no change.

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Benton P. U. D. to Condemn Pacific Power Properties

Benton County (Wash.) Public Utility District commissioners have voted to condemn the properties of the Pacific Power & Light Co.

Purchase of the properties is to be financed by electric revenue bonds. A total of $850,000 of these is to be issued. Estimated value of the properties is placed at $500,000. W. S. McRea, Jr., Tacoma, was awarded the engineer's contract, and Houghton, Cluck & Coughlin, Seattle, and George Beardsley, Prosser, will be attorneys for the district.

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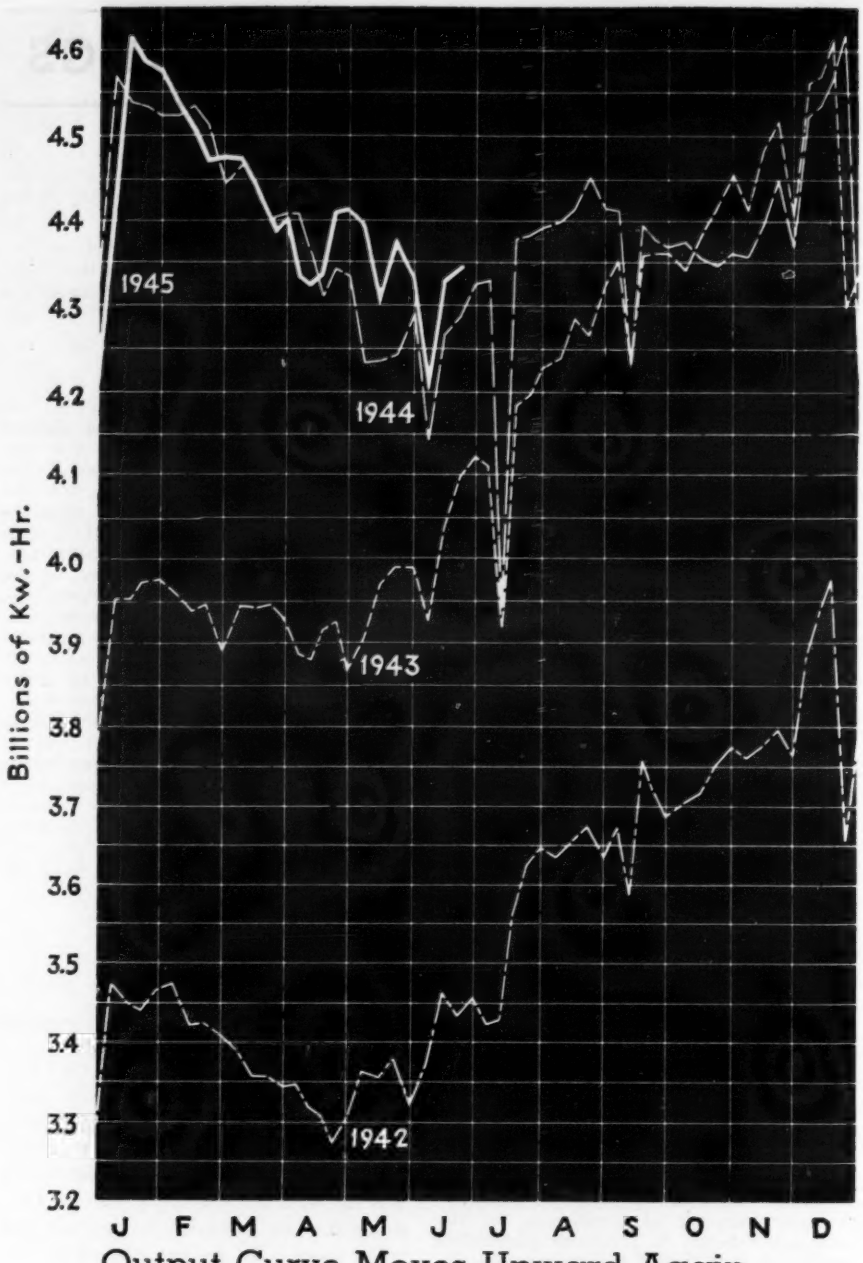
May Buy Oregon Utility

California Pacific Utilities Co. has received permission of the California Railroad Commission to purchase for $265,000 the West Coast Power Co. which serves Grant and Harney Counties, Oregon.



Output Curve Moves Upward Again

The electric output curve moved upward during the week ended June 16, 1945, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry totaled 4,348,413,000 kw.-hr., compared with 4,327,028,000 kw.-hr. during the preceding week. During the week ended June 17, 1944, the amount of electrical energy distributed amounted to 4,287,251,000 kw.-hr., this year's figure representing an increase of 1.4 percent.

Four of the seven major geographical regions of the country reported increases over last year, as compared with five for the preceding week, the New England group moving into the minus column with a loss of 0.3 percent. The largest increase was reported by the Southern States, 7.0 percent.

Weekly Output Millions Kw.-Hr.

1945		1944		1943	
June 16	4,348	June 17	4,287	June 19	4,098
June 9	4,327	June 10	4,265	June 12	4,040
June 2	4,204	June 3	4,144	June 5	3,926
May 26	4,330	May 27	4,292	May 29	3,990
May 19	4,377	May 20	4,246	May 22	3,992
May 12	4,302	May 13	4,238	May 15	3,969
May 5	4,397	May 6	4,234	May 8	3,504
Apr. 28	4,416	Apr. 29	4,336	May 1	3,867
Apr. 21	4,411	Apr. 22	4,344	Apr. 24	3,925
Apr. 14	4,332	Apr. 15	4,307	Apr. 17	3,917
Apr. 7	4,322	Apr. 8	4,361	Apr. 10	3,882
Mar. 31	4,329	Apr. 1	4,409	Apr. 3	3,890

Percent Change From Previous Year

	Week Ending		
	June 16	June 9	June 2
New England	− 0.3	+ 0.6	+ 2.2
Mid Atlantic	+ 2.2	+ 2.6	0.0
Central Industrial	+ 0.9	+ 2.0	+ 2.7
West Central	+ 5.0	+ 5.2	+ 3.9
Southern States	+ 7.0	+ 5.8	+ 6.8
Rocky Mountain	− 1.0	− 3.5	− 0.1
Pacific Coast	− 4.3	− 4.1	− 3.3
Total United States	+ 1.4	+ 1.5	+ 1.4

SEC DECISIONS—HEARINGS

The Securities and Exchange Commission in a series of orders recently issued affecting electric utility companies:

HAS APPROVED New England Gas & Electric Association's proposal to donate all of the outstanding income notes and capital stocks of two of its wholly owned subsidiary electric utility companies to a third subsidiary electric utility company. Under terms of the approved proposal, the securiteis of the Derry Electric Co. and the Lamprey River Improvement Co. will pass from New England to New Hampshire Gas & Electric Co. The latter's acquisition of Derry and Lamprey, initial steps in a program looking toward their merger into New Hampshire, has been approved by the New Hampshire Public Service Commission. The proposed merger will be considered at hearings to be held sometime in the future. New England conceded that it had to dispose of its interest in the three subsidiaries involved in the proposal in order to effectuate compliance with the provision of Section 11 (B) (1) of the Holding Company Act. The SEC reversed jurisdiction over accounting entries to be made on New Hampshire's books to reflect the acquisition of the securities.

GAVE INTERESTED parties until June 25 to ask for a hearing on the proposal of trustees of Midland Utilities Co. to acquire from Hobart Light & Power Co., a subsidiary, all the latter's assets in full payment of demand notes of Hobart held by the trustees in the principal amount of $479,153 and accrued interest to the date of consummation of the transaction. Hobart has been inactive since November 30, 1942. The latter's assets consist of 69,500 shares of common stock of Northern Indiana Public Service Co. and cash of $6,798.

APPROVED PROPOSAL of Long Island Lighting Co. to issue certificates of deposit to its preferred and common stockholders in exchange for, and as evidence of, their voluntary deposit of certificates for the company's Series A 7 percent cumulative preferred stock, Series B 6 percent cumulative preferred stock, and common stock. The purpose of issuing the certificates, the company stated, is to afford such stockholders a "convenient and orderly" means for transferring their present holdings on the books of the company pending determination of the proceedings with respect to Long Island's proposed recapitalization. The commission also approved the application of the New York Curb Exchange for permission to extend unlisted trading privileges to the certificates of deposit. The Curb had suspended trading in the preferred and common stocks of Long Island on December 19, 1944, when the SEC instituted legal proceedings to halt consummation of the proposed recapitalization of the company pending determination of the question as to whether the commission should modify or revoke the exemption from the Holding Company Act previously granted the company.

APPROVED AMENDED plan of United Corp. providing for the exchange of two shares of Delaware Power & Light Co. common and $6 in cash for each share of its own $3 cumulative preference stock. The company's original proposal provided for the exchange of two share of Delaware Power common and $5 in cash.

APPROVED PAYMENT to Drexel & Co., Philadelphia of a $35,000 fee for their services as financial advisor to the Philadelphia Electric Co. during its recent $130,000,000 bond offering.

Application Filed

COMMONWEALTH & SOUTHERN CORP. has filed amendments to its amended plan of recapitalization, which endow the new common stock created through exchange of common stocks of four subsidiaries, with the right of cumulative voting in all elections of directors after distribution of 75 percent of the stock. The amendments also provide that prior to distribution of the common stocks of Consumers Power Co. and Southern Indiana Gas & Electric Co., the charters of both companies be amended to give the preferred stocks power to elect a majority of the board of directors, upon default of one year's dividends. The plan was filed with the commission in February, 1944, and approved on May 31 last, subject to filing of the amendments within fifteen days. Following approval of the proposed amendments by the commission, the plan will be presented to stockholders. If approved by them, the commission, will make application for court enforcement of the plan.

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Buffalo Will Continue Tax on Gross Utilities Income

Buffalo will continue to collect a 1 percent tax on the gross income of utilities. The city realized $420,007.16 from the tax during the fiscal year which ended July 1, 1944. The tax originally was imposed by New York state in 1937 to aid the city in paying for welfare and relief costs. By an amendment to the state law, the proceeds of the tax, now imposed by the city, may be used for general city purposes. At a recent public hearing held in compliance with State law no opposition developed.

UTILITY REPORTS

	Net income 1945	1944
*Arkansas Power & Light	$2,435,869	$1,232,035
*California Elec. Power and subs	1,269,060	1,299,649
*Carolina Power & Light	2,370,461	2,555,340
*Mississippi Power & Light	1,470,513	528,744
*Montana Power	4,046,576	4,310,017
*New Orleans Public Service	1,950,828	1,617,823
*Pennsylvania Power & Light	5,392,316	5,711,149
*Puget Sound Power & Light and subs	4,832,607	5,451,506
*Public Service of New Hampshire	1,389,049	1,402,322
*Washington Water Power and sub	2,637,644	2,893,417

*Twelve months ended April 30.

Narragansett Plans Extra 110-kv. Line for Protection

Designed to give the Narragansett Electric Co. system additional protection against major interruptions until such time as the present generating capacity can be expanded, an additional 110-kv. wooden pole transmission line will be built between Millbury, Mass. and Providence. Federal authorities have granted priorities, and construction will begin in the near future.

The Millbury dispatching center is the "heart" of the New England Power system, and Providence is already connected with it by a 110-kv. line and two 66-kv. lines. However, the local load on these lines has grown to such an extent that additional protection against major outages is necessary.

The Millbury station is linked with the hydroelectric sources in the north and is also connected with most of the major power sources in New England and New York State. The new line will be brought from Millbury to the Admiral Street substation in Providence and then connected through 12,000 ft. of cable to the Franklin Square substation, from whence circuits radiate to all distributing points of the Narragansett system. Seven hundred feet of the cable will be submarine, and the rest will be oil-filled and laid in existing ducts. The total length of the new line including overhead and cable will be about 33 miles.

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Preparatory Work Begins on Vancouver Substation

Preparatory work began late in June on the new Main Street Substation of the British Columbia Electric Railway Co. in Vancouver.

The substation, which will have an estimated capacity of 75,000 kva., will serve as a key link in the 60-kv. double-circuit transmission line which it is planned to construct around the Burrard peninsula area of Vancouver.

All of the outgoing circuits from the substations will be built and extended underground through the business area so that eventually all overhead light and power circuits can be removed.

Transformers of semi-outdoor type will each have a nominal capacity of 20,000 kva. and will be of the three-phase, three-winding, forced-air-cooled type. The power will be transformed from 60 kv. to 12 kv. and 4 kv. for distribution.

The building and equipment, which will cost approximately $2,000,000, will take nearly two years to complete.

How

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

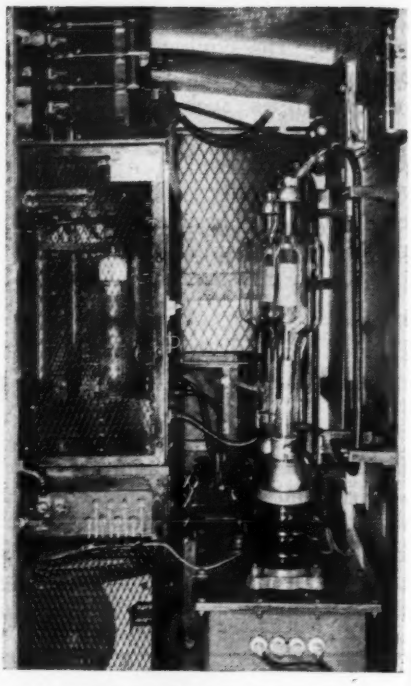
Raised Voltage Improves Fault-Locating Set

M. W. GHEN
Superintendent of Operations, Downtown Division
Duquesne Light Co., Pittsburgh, Pa.

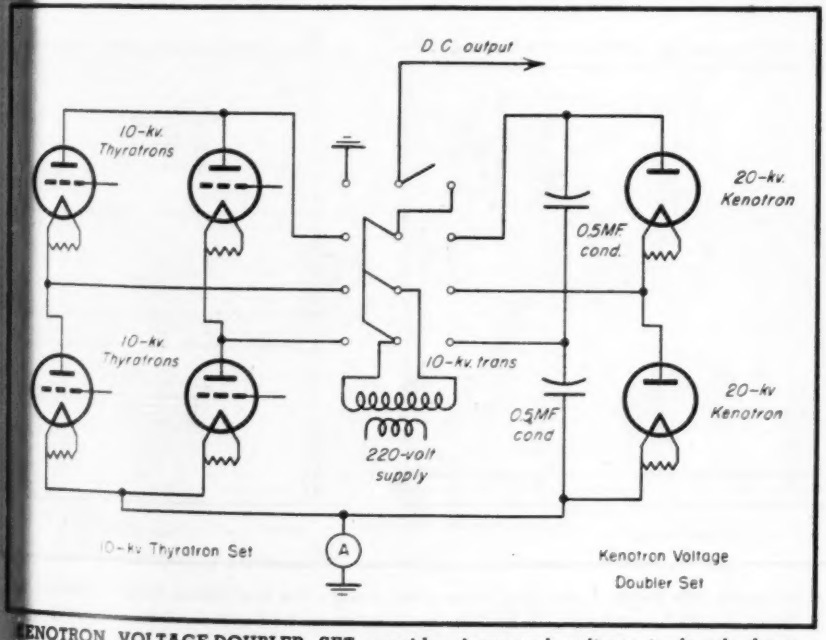
Many fault locating sets for locating underground cable faults are effective so long as the fault to be located is of low resistance or can be reduced to a low resistance in a reasonable length of time. Unfortunately, this is not always the case. Occasional faults occur which are of high resistance and defy every effort to reduce them by the means available. To locate such faults the Duquesne Light Co. has more than doubled the voltage of its portable 10,000-volt d.c. test set by a few simple additions.

The set in question was purchased in 1936 and was described in the January 13, 1940 issue of ELECTRICAL WORLD. It consists of a dry type transformer with necessary control equipment to feed four 10,000-volt thyratron rectifier tubes which supply 10,000/5,000-volt, 5/10-amp. direct current for fault location. Current interruption for use as a tracer after fault is reduced is accomplished by control of the grid circuit of the tube.

At the time this test equipment was purchased, consideration was given to purchasing a 20,000/10,000-volt set to insure rapid location of faults by use of the higher voltage. Since the equipment in question was oil filled and of much greater weight, it would have required the use of a 5-ton truck instead of the 1½-ton chassis which was purchased.



DOUBLE-SECONDARY filament transformer adjacent to two kenotron tubes (right). Four-tube thyratron equipment within grill enclosure (left center) Throw-over switch at top



KENOTRON VOLTAGE-DOUBLER SET provides increased voltage to break down stubborn faults, in some cases from two to five minutes

In most cases the 10,000/5,000-volt test set has given excellent results. However, there have been a few faults encountered which have been extremely difficult to reduce in resistance. In such cases, it was necessary to resort to constant current street lighting equipment or other means as a source of higher voltage. In one case the line was re-energized from a station bus and did not fail again for several hours.

In order to get a higher test voltage for reducing cable faults without the added weight necessary for

oil filled equipment, a simple means of using the present transformer equipment to provide approximately 25,000 volts was developed. A voltage doubler circuit was used employing one double-winding filament transformer, two old 100-kv. kenotron tubes, two old condenser units of 0.5 m.f. and 12,000-volt rating. This circuit is shown in the accompanying diagram. The equipment itself has been provided with protective gaps and was installed according to approved safety practices.

The two tubes used were available 100-kv. kenotron tubes operating at reduced voltage but any tube of 20-kv. rating would operate satisfactorily. The equipment has been provided with high-voltage throw-over facilities such that the thyratron set may be employed to provide tracer current in a period of ten seconds after the 25,000-volt equipment has been removed from the line. The equipment in question provides a measured d.c. voltage of approximately 25,000-volts. This voltage is determined by the peak of the a.c. wave rather than the r.m.s. value since both positive and negative waves charge condenser units. The additional equipment weighs approximately 400 lb.

Stubborn Faults Succumb

The equipment was thoroughly tested on faults created on short pieces of cable where observation was possible. This established, very definitely, the fact that many types of faults which could not be located by the 10,000-volt set could be reduced in a period of a few minutes with the 25,000-volt source. Further test on actual lines established the feasibility of its use in the field.

To date three service faults which have not responded to the 10,000-volt equipment have been successfully reduced with the higher voltage in periods of from two to five minutes. In all cases the new equipment performed satisfactorily.

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Steel House Protects Industrial Transformers

Steel houses for industrial transformer installations with underground service and involving banks from three 75-kva. units up to three 150-kva. units have proved advantageous to the Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y. Advantages over the conventional outdoor installation are low upkeep, only a coat of paint is required to protect the steel; more complete protection against sabotage or vandalism because the units are completely encased; and easier reading, servicing and testing of high voltage meters because of installation at convenient height.

These houses, which are made of 16-gauge sheet steel sides and a gauge roof, are made in the company's shop, hauled to the job on truck, lowered over the installed transformer banks, and anchored to the concrete base.

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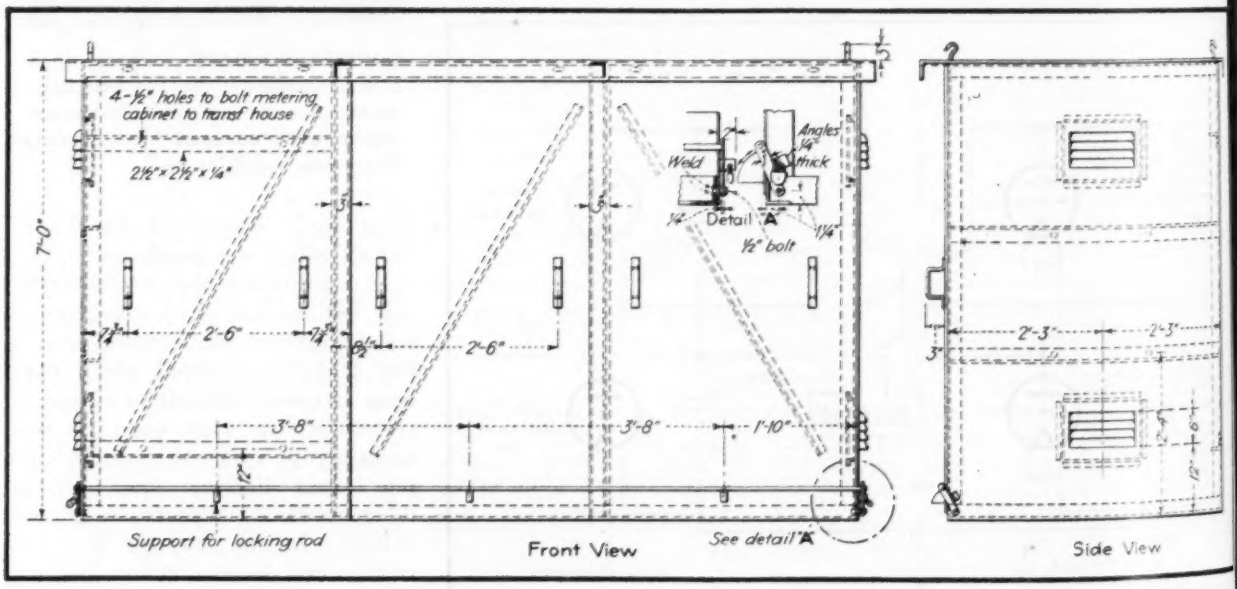
Use Series Field As Inertialess Relay

A. D. THERRIEN
Northern Indiana Public Service Co., Hammond, Ind.

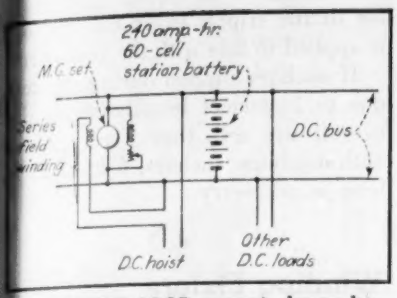
An unpredictable and irregular heavy current drain imposed on storage batteries at Marktown substation by a d.c. hoist used for handling metal-clad circuit breakers has led the Northern Indiana Public Service Co. to adopt a novel but effective series field connection on the battery-charging m.g. set.

Batteries at this substation are floated on the bus at 129 volts via a 7½-kw., m.g.-set in which the generator is shunt connected. To handle the infrequent d.c. hoist load, without drawing the station batteries down seriously, some way was sought of throwing all of this load on the m.g. set. Thus some means was needed for boosting the field strength of the d.c. generator automatically whenever the hoist load came on.

The generator series field winding



STEEL SIDE WALL AND ROOF is welded to the angle iron every 6 in. by a ½-in. fillet weld. The 3-in. lifting hook is welded to the angle iron directly over the corner. The doors are stiffened by a 1-in. by 1-in. by ⅛-in. angle iron spot-welded to the 16 gauge sheet steel. Doors are removed, for access to transformers, by lifting upward and outward. They are locked in position by a ½-in. steel bar which has an eared-end-piece to accommodate the lock. Roof is 12-gauge stock



BY PASSING LOAD current, drawn by d.c. hoist, through generator series field winding of m.g. set, field strength is increased causing generator to assume hoist load in preference to battery

offered this means. Since the generator was operating shunt connected the series field winding had been disconnected. It remained only to connect the series field winding so that current drawn by the hoist passed through it. Thus when the hoist load came on, the field strength of the generator was automatically increased. This in turn increased the generator voltage enough to cause the generator to carry the hoist load. However, when the hoist was shut down current no longer flowed in the series field and the generator again operated normally as a shunt generator for charging batteries.

It should be pointed out that the hoist was not in regular service at this substation but was used only during breaker maintenance periods. At such times, however, it might be used daily for as much as a week. Such use constituted a serious drain on the battery. During emergencies when the m.g. set is not operating, however, the battery is used to operate the hoist.

The m.g.-set at Marktown substation has been operating with the series field connected as explained for several years with complete success. The generator assumes the hoist load instantly when it comes on and without any interference with other devices connected to the station d.c. bus.

• • •

Test-Jack for Indoor Meters

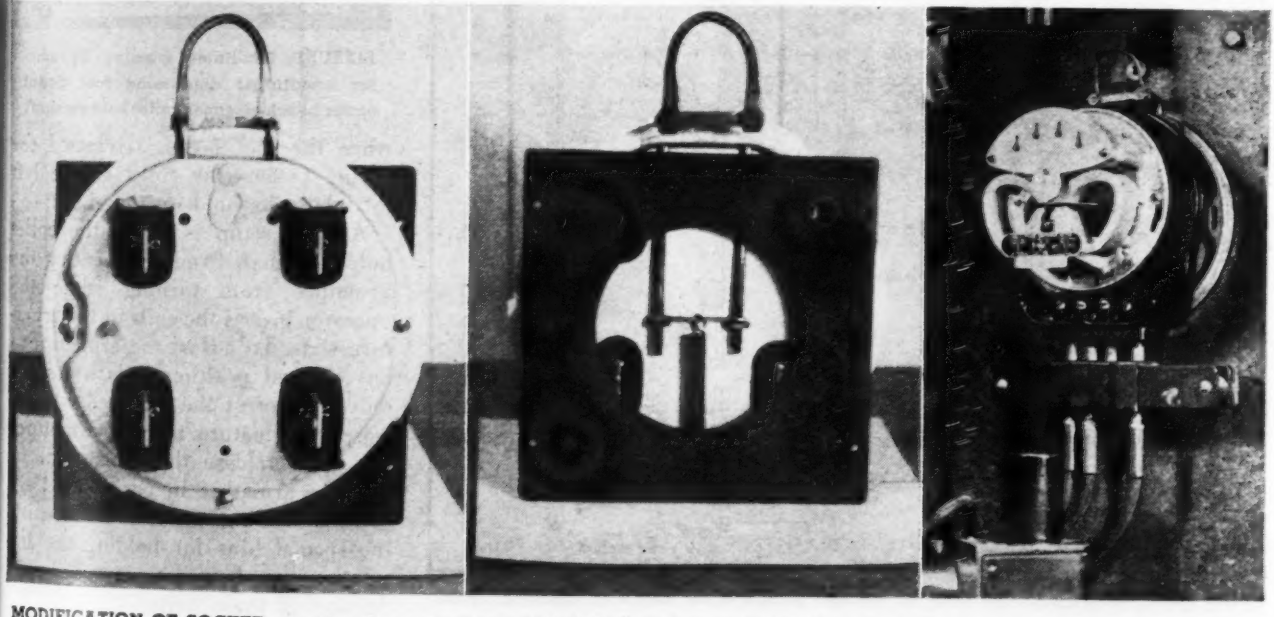
C. W. PINKEL

Meter Supervisor, Illinois Power Co., Belleville, Ill.

In constructing a meter test board to test both indoor and outdoor meters, it was found necessary to devise a special test jack to hold indoor type meters. The socket meters were held to the test board by mounting a regular socket in the test board permanently, then in order to provide a simple and extremely practical way to hold indoor type meters for test, a special jack was made of old parts.

The base of the jack was taken from a meter conversion part. This consists of the base plate, and the four prongs or terminals with insulators. An old Bakelite top from a phantom load was attached by small bolts to the front of this base to serve as an insulator. (A piece of press wood or other insulating board would serve the same purpose.) Two holes were drilled through the flange on the back of the base plate about 1¾ in. apart, through these holes two cover studs from a type H Sangamo meter were inserted. These studs are about 5½ in. long with threads on both ends. The top ends of the studs were bent at right angles about one inch from the top and a brass strip was bolted on the top ends of the bolts, forming a clamp to hold the top hanger of the meter under test. In connection with this brass strip a copper "U" shaped wire was placed across the same bolts as the brass strip to serve as a means of pulling the clamp up while putting the meter on for test. Another piece of brass was bolted across the bottom of these two long studs to hold these bolts rigid and to serve as an anchor for the spring which holds the clamp and bolts in proper line. The spring was made from a piece of screen door spring and is about 2½ in. long. The lower end of the spring is bolted to the base plate near the bottom.

When testing an indoor meter the jack is pressed into the regular socket (used for S type meters under test) on the test board. Then the indoor meter is placed over the test prongs or leads used to give potential and current to the meter. At the same time the brass "U" shaped bolt at top of the jack is pulled up and the meter pushed against the Bakelite plate or stop board. Then the "U" shaped bolt is released and the flat brass strip, slips over the top hanger



MODIFICATION OF SOCKET provides clamping means to hold indoor type meter for test

of the meter holding it in place. The bottom of the meter is supported by the test prongs and leads; the test prongs and leads can be purchased from The States Co.

At present we have five sets of these jacks which have been in service over three years.

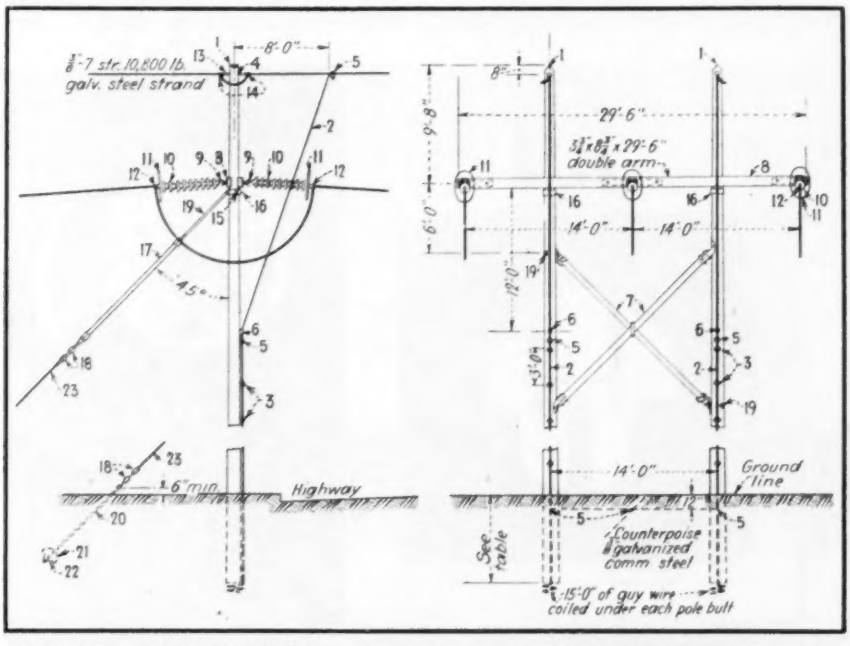
•

Highway Crossing for 110-Kv. Line

In connection with the construction of an important 110-kv. tie line in the east the accompanying design for crossing highways on a tangent was developed. The crossarms were made 6 in. longer than those used on straight runs off the highway, in order to accommodate dead-end tees. Back guys only were used on this type of structure.

MATERIAL LIST

Item	Quantity	Material
1	2	55'-60 or 65' C.S.Y.P. Poles
2	150	⅜" Galvanized Comm. Steel Strand
3	2 lb.	2" Galvanized Staples
4	2	Locke "3961 Shoulder Eyebolts
5	7	Hubbard "8482 Wire Rope Clips
6	2	Hubbard "1316 Drive Hooks
7	1 Set	Hughes "1042 Cross Brace, Complete
8	1 Set	Hughes "D-121 Al Tangent Arm, Complete
9	6	Locke "8440 Hooks
10	5	Locke "18140 Insulators
11	6	Locke Cat "U 90178 Grading Rings
12	6	Locke "442 Strain Clamps
13	2	Locke "6515 Long Bolteyes
14	4	Locke "20293 Strain Clamps
15	6	⅝ x 4" Lag Screws
16	2	Hughes "1111 Pole Bands
17	2	Hughes "D-121 25,000 lb. Strain Insulators
18	8	3" Bolt Guy Clamps
19	2 Pairs	Hughes 5 Ft. Special Connecting Links
20	2	¾ x 8'-0" Anchor Rods
21	2	Wood Anchors (10 x 30" or 12 x 24")
22	2	4 x 4 x ¼" Square Washers
23	As Req'd	⅜"-14,500 lb. Bethanized "A" Steel Wire



SIDE AND FRONT ELEVATIONS of wooden structure for highway crossing. Pole setting depths are 7 ft. 6 in. for 55-ft.; 8 ft. for 60 ft.; and 8 ft. 6 in. for 65-ft. poles

Loading Frame Checks Strength of Anchors

Shown in the accompanying picture is the pulling frame devised for testing the holding strength of 16-in. cone anchors installed on guyed structures in the 132-kv. Port Washington-Granville transmission line of Wisconsin Electric Power Co., Milwaukee, completed last year.

DYNAMOMETER and multiplier bars check holding strength of anchors

All cone anchors on this line were required to withstand 10,000-lb. or 12,000-lb. tension for two minutes without creep. Load was applied with the illustrated tripod and pole-jack combination. Multiplier bars and a 5,000-lb. dynamometer were used to read the load. By moving the center leg of the tripod in or out the load is applied in line with the anchor rod.

If anchors slipped during this test, due to imperfect installation or due to soft wet soil, they were replaced with deadmen anchors, 6 ft. to 12 ft. long as necessary.

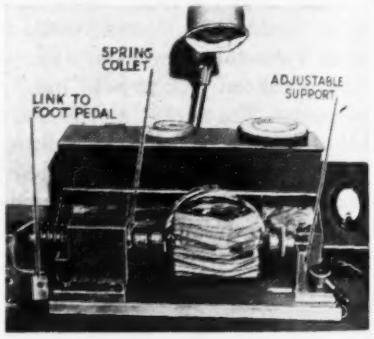
•

Winding Fixture for Armatures

R. E. HIXON
Westinghouse Electric Corp.
Lima, Ohio

Winding fixture shown in the illustration was developed to facilitate winding dynamotor armatures. A spring collet, which is mounted in the left support, holds one end of the armature shaft. The other end of the shaft rests in a V-groove in the right support which is adjustable to hold armatures of various lengths.

The collet and spring arrangement is foot operated, being linked to a foot pedal under the bench. When the foot pedal is depressed it moves the right angle lever which in turn pushes the collet to the right to release it and loosen its hold on the shaft;



FIXTURE facilitates winding dynamotor armatures; depressing foot pedal under bench releases collet hold on shaft

when the foot pedal is released the spring pushes the collet to the left to tighten its hold on the shaft.

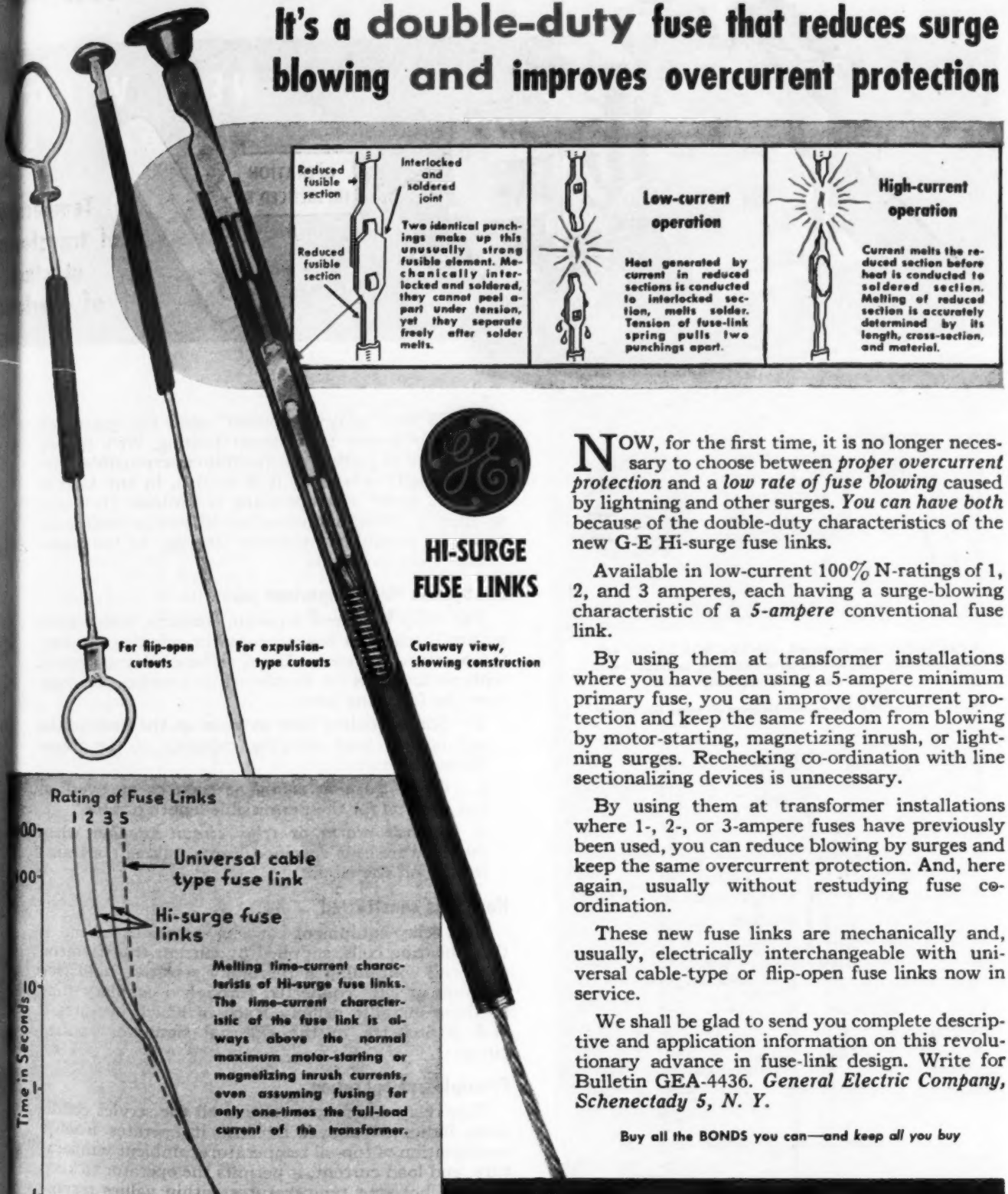
After a setup is made, the collet holds the shaft firmly, preventing the armature from turning while the operator inserts the coils in the armature slots. To adjust the armature to any desired position it is necessary only to depress the foot pedal to release the armature, turn the armature, and then release the foot pedal to lock the armature in position.

The winding fixture, along with the special bins for holding the insulation, has helped to increase production of these units.

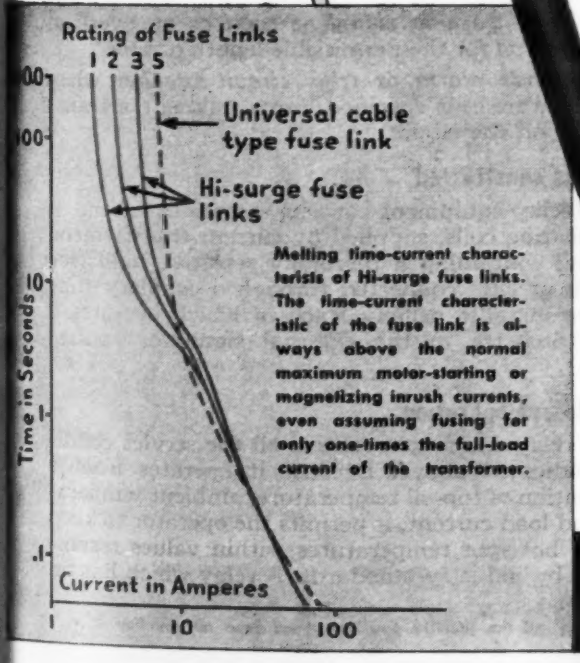
(Republication of the above is reserved.)

HERE'S A NEW FUSE LINK THAT'S REALLY DIFFERENT

It's a double-duty fuse that reduces surge blowing and improves overcurrent protection


Reduced fusible section
Interlocked and soldered joint
Reduced fusible section
Two identical punchings make up this unusually strong fusible element. Mechanically interlocked and soldered, they cannot peel apart under tension, yet they separate freely after solder melts.
Low-current operation
Heat generated by current in reduced sections is conducted to interlocked section, melts solder. Tension of fuse-link spring pulls two punchings apart.
High-current operation
Current melts the reduced section before heat is conducted to soldered section. Melting of reduced section is accurately determined by its length, cross-section, and material.
For flip-open cutouts
For expulsion-type cutouts
Cutaway view, showing construction

HI-SURGE FUSE LINKS



Melting time-current characteristics of Hi-surge fuse links. The time-current characteristic of the fuse link is always above the normal maximum motor-starting or magnetizing inrush currents, even assuming fusing for only one-times the full-load current of the transformer.

NOW, for the first time, it is no longer necessary to choose between *proper overcurrent protection* and a *low rate of fuse blowing* caused by lightning and other surges. *You can have both* because of the double-duty characteristics of the new G-E Hi-surge fuse links.

Available in low-current 100% N-ratings of 1, 2, and 3 amperes, each having a surge-blowing characteristic of a *5-ampere* conventional fuse link.

By using them at transformer installations where you have been using a 5-ampere minimum primary fuse, you can improve overcurrent protection and keep the same freedom from blowing by motor-starting, magnetizing inrush, or lightning surges. Rechecking co-ordination with line sectionalizing devices is unnecessary.

By using them at transformer installations where 1-, 2-, or 3-ampere fuses have previously been used, you can reduce blowing by surges and keep the same overcurrent protection. And, here again, usually without restudying fuse co-ordination.

These new fuse links are mechanically and, usually, electrically interchangeable with universal cable-type or flip-open fuse links now in service.

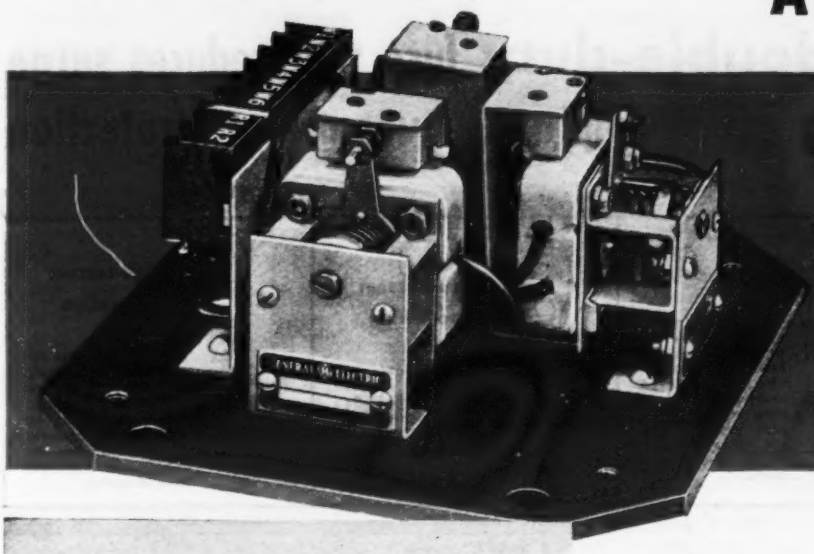
We shall be glad to send you complete descriptive and application information on this revolutionary advance in fuse-link design. Write for Bulletin GEA-4436. *General Electric Company, Schenectady 5, N. Y.*

Buy all the BONDS you can—and keep all you buy

GENERAL ELECTRIC

NOW Hot-spot Protectio

Available with G



NEW WINDI

OPERATION INFLUENCED BY

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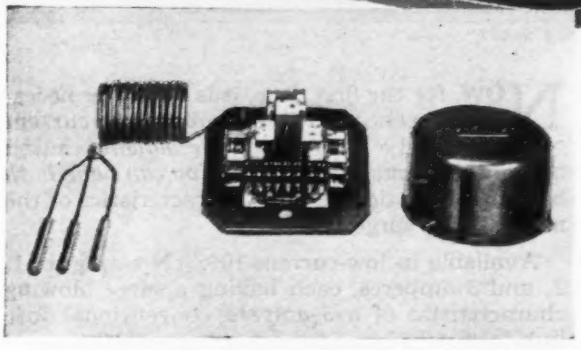
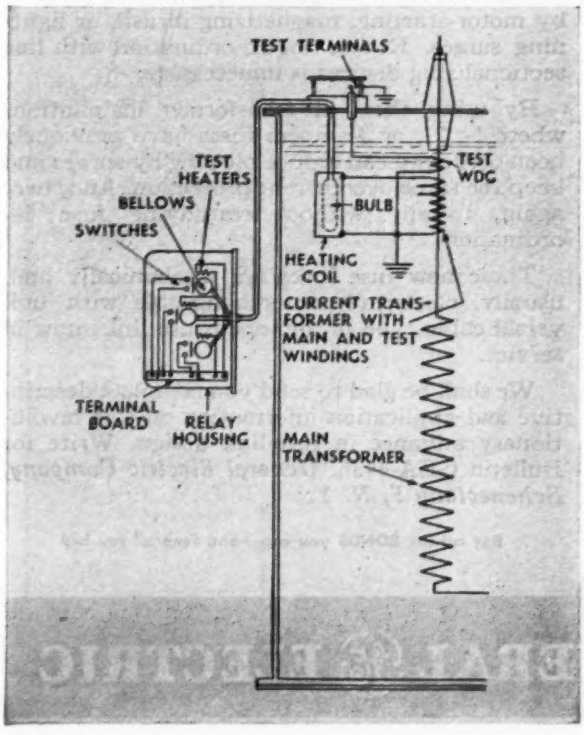


Relay with cover removed, capillary tube (coiled up), and thermally sensitive bulbs—one, two, or three bulbs can be used as required.

(below) Simplified schematic diagram of relay equipment



THIS new relay equipment takes the guesswork out of power transformer loading. With it, you can be sure of getting the *maximum permissible* overload capacity whenever it is needed, in any kind of weather, under any operating conditions. Its 4-way sensitivity, being influenced by all service conditions, makes it possible to prevent damage to the transformer from overloads.

Does these three important jobs

The relay has three separate contacts, which automatically close in sequence as the winding hot-spot temperature increases. On a self-cooled transformer with cooling fans for supplementary rating, the relay does the following jobs.

1. *Starts cooling fans* as soon as the limit of the self-cooled, load-carrying capacity of the transformer is reached.
2. *Gives warning signal* as soon as an overload has been on for the permissible length of time.
3. *Sounds alarm or trips circuit breaker* when overload exceeds specified limits, taking the transformer off the circuit.

How it is constructed

This relay equipment consists essentially of one to three heating coils, supplied by current transformers, each coil containing a thermally sensitive bulb (see diagram at left) connected through a capillary tube to three metallic bellows, each of which operates a G-E Switchette in the external signal or control circuits.

Principles of operation

This relay equipment reflects all the service conditions indicated above. Because it operates from a combination of top-oil temperature, ambient temperature, and load current, it permits the operator to keep winding hot-spot temperatures within values recommended by industry standards. A relay which has no

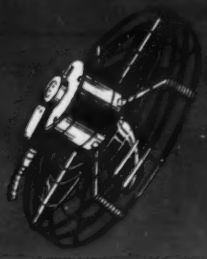
Buy all the BONDS you can—and keep all you buy

...thout Sacrificing Loadability

...wer transformers

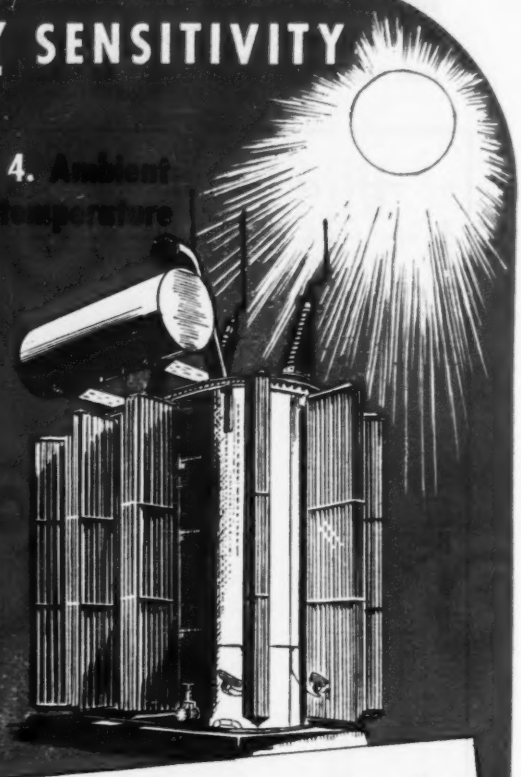
...ERATURE RELAY HAS 4-WAY SENSITIVITY

2. Duration of overload



3. Method of cooling

4. Ambient temperature

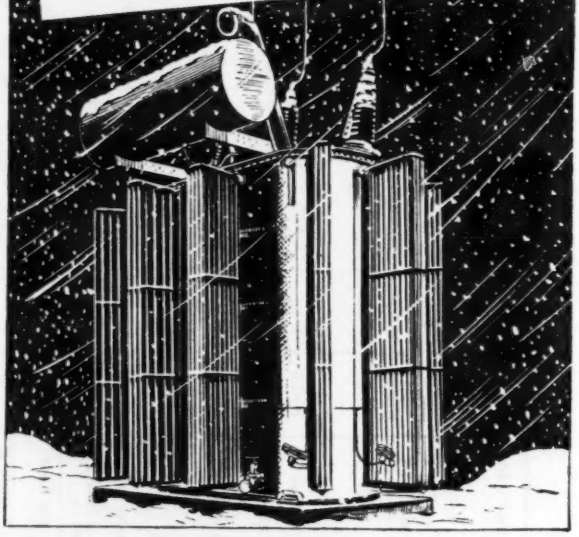


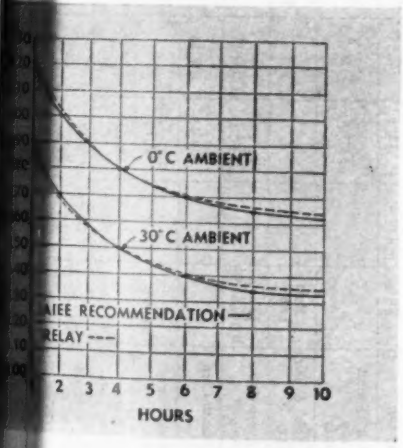
ambient temperature compensation, if set for maximum permissible hot-spot temperature in average weather, can mislead the operator, as it permits excessive overloads in cold weather and prevents maximum permissible overloads in hot weather. The G-E relay operates accurately in all ambients. Overloads can be limited to values in close agreement with AIEE recommendations (see chart below) for all overload conditions. When used on a three-phase transformer, the relay can be arranged to operate in response to the temperature of the phase which has the greatest load.

This unique relay equipment can be obtained on all new G-E power transformers, as an optional item, at a slight increase in the over-all transformer price. All the parts are accurately adjusted at the factory to assure matched performance with each transformer.

For full information on how this relay works, and other descriptive data, ask for Bulletin GEA-4396. *General Electric Company, Schenectady 5, N. Y.*

The relay is self-compensating in any kind of weather





Overload values as limited by the relay in relation to AIEE recommendations. The relay curves are based on operation of the final contact.

POWER TRANSFORMERS

GENERAL ELECTRIC

401-24-5155

A GUIDE TO USE OF ARC WELDING ELECTRODES

Accompanying chart lists various kinds of electrodes for arc welding of ferrous metals other than stainless steel, with a.c. and d.c. power, and in different positions. Electrodes for use with stainless steel are listed on the succeeding page.

American Welding Society classification numbers for electrodes serve as the basis for the guide, and the listings provide a comparison for the types of electrodes produced by 21 manufacturers. These data made available by Allis-Chalmers Mfg. Co.

Electrode	Bare	Dusted	Heavily Coated Types (Mild Steel)							Alloy Electrodes				Special Types		
Type of Work	Bare Rod Welding	Bare Rod Welding	All Position Welding	A.C. Welding	General Purpose Welding and Poor Fitup	A.C. or D.C. Welding	Horizontal Fillet and Downhand Welding	Downhand Welding	All Position Welding of Alloy Steels	Horizontal Fillets And Downhand Welding 70,000 p.s.i. Steels	Downhand Welding of 70,000 p.s.i. Steels	Machineable Cast Iron Weld Deposits	Non-Machineable Cast Iron Weld Deposits	All Position Welding for Slight Resistance to Abrasion
A. W. S. Class No.	E-4510	E-4511	E-6010	E-6011	E-6012	E-6013	E-6020	E-6030	E-7010	E-7020	E-7030			
Air Reduction Sales Co.	41	44 63	78E 79E	230	87 187	90 or 90A	81 or 83	83	93	94	94	55 95	77	46
Allied Welderaft, Inc.	Arc Craft B		55 55W	77 77W	70 70W	77W	60		Arc Craft Moly	70				
Allis-Chalmers Mfg. Co.			E-6010	E-6011	E-6012	E-6013	E-6020	E-6030	E-7010	E-7020	E-7030	X-10		X-1
American Agile Co.			White	Blue	Red-White	Blue-Red	Blu-Gray	Blue-Gray	Orange	Black-White		Yellow		Pink
Central Steel & Wire Co.	Sul 18	Steelkote 18	White Flash B	White Flash E	White Flash E	White Flash E	White Flash E	White Flash C	White Flash D			Blukote		Steelkote 110
Champion Rivet Co.	Sulcoat	Processed	Blue Devil	Bluedac	Gray Devil	Gray Devil No. 2	Black Devil	Red Devil Black Devil	Blue Devil 85	Red Devil 75	Red Devil 75	Machineable Cast Iron	Non-Machineable	
Chicago Steel and Wire Co.			Ductone P	Ductone AC	Ductone NAC	Ductone AC							Bluestreak	E-75 E-110
General Electric Co.	Type L	F, H, M or W-4	W-22 or W-22H	W-26	W-20 W-30	W-25	W-24	W-23 or W-24	W-52	W-54	W-54	W-80	W-80	Type 1
Harnischfeger Corp.	Litecote	Dustcote	AP or AC-1	AC-1	PF, AC-3 or FR	Harcraft or AC-3	DH-2 or FW		CM-50	CM-50				110
Hobart Brothers Co.	Sulcoat	Sulcoat	55	AC-55	77	AC-77	111	111	885		111 HT			
Hollup Corp.	30-XL	30-S	Sureweld B	Sureweld C	Sureweld N	Sureweld C	Sureweld F	Sureweld A	Sureweld MLY	Sureweld MLY-A	Sureweld MLY-A	Cl-22 Arcast	Cl-8	7 70
Lincoln Electric Co.		Stable-Arc Softweld	Fleetweld 5 Fleetweld 35	Fleetweld 5 Fleetweld 35	Fleetweld 7	Fleetweld 37	Fleetweld 9	Fleetweld 9	Shieldare 85	Fleetweld GHT	Fleetweld 9 HT	Softweld Anode	Ferroweld	Hardweld
Marquette Mfg. Co.	Sulcoat	Dustcoat	151 31-DR	151	151 25-ADS	151	33-ADS	33 ADS				42		
McKay Co.	21	2 or 3	15		17 116	116 117	16	16	715	716	716			
Metal & Thermit Corp. (Murex)			Vertex	Type A	Genex	Alternex	Fillet, Type FHP or F	Type FHP or F	Molex	Type M Carbon MLY-50	Carbon Moly. 50			
Page Steel & Wire Div.	B Rust Line		C		F or CR	AF								H.C.
Reid Avery Co.	D or Blue Label		HD-7	HD-11	HD-8	HD-13	20 HD-6	HD-5	74	64	H-D 54			82
A. O. Smith Corp.			SW-10	SW-15	SW-11		SW-35	SW-20	SW-75	SW-73 SW-76				
Universal Power Corp.	Standare B	G	Hevi-Kote R.P.		Hevi-Kote SP-2		Hevi-Kote F.F.	Easy Weld C-2						
Westinghouse Electric Corp.	18 Sulcoat	18 Sulcoat	Flexare AP	ACP	FP SW	FP SW	Flexare DH	Flexare DH	AP Moly	DH Moly	DH Moly			Hardentough 1D
Wilson Welder & Metals Co.	Sulcoat 17	17 Dipped, Coat up to	99-N V and O	5/32	107 108	5/32 or 3/16	108	3/32 or 1/8	Alloy Rod	Alloy Rod 16	Alloy Rod 16	12	97	

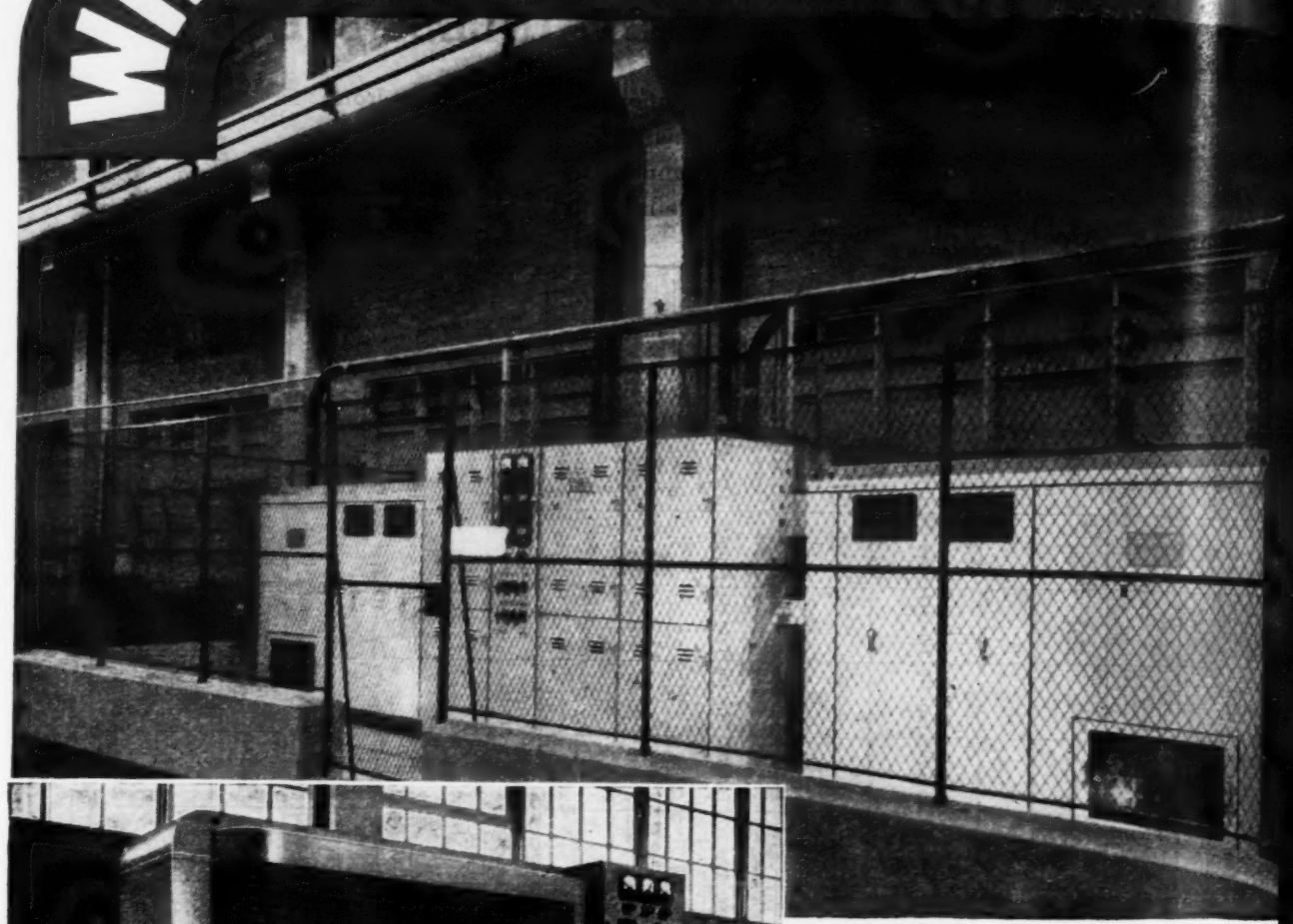
A GUIDE TO USE OF ELECTRODES FOR ARC WELDING STAINLESS STEEL

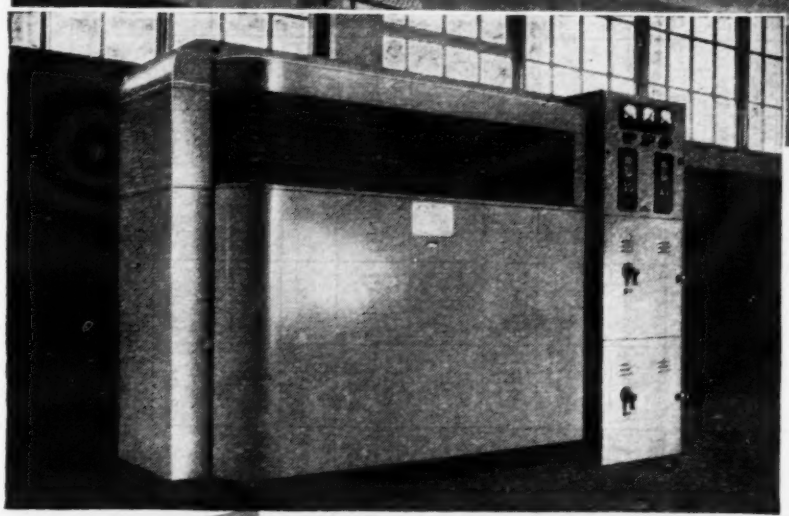
Chart has electrode classification of the American Iron and Steel Institute as the basis for the guide and includes listings for 15 electrode manufacturers. This compilation has been made available by Allis-Chalmers Mfg. Co.

A. I. S. I. Class No.	302 304 308	309	310	311	316	317	329	330	347	403 410	430	442	446	501 502	MN. Modified for Armor Plate Welding
Air Reduction Sales Co. Airco*	No. 19-9	No. 25-12													
Allied Welderaft, Inc. Stain-Craft*	K	HC 25-12Cb.	HCN 25-20Cb. 25-20Mo.	HN	18-8Mo.	18-8Mo.	25-3Mo.	15-35	18-8Cb.	12	16	18	28	5Mo	Armor-Craft
Allis-Chalmers Mfg. Co.	308	309 309Cb.	310 310Cb.						347						
Alloy Rods Arcaloy*	Type 308	Type 309 Type 309Cb.	Type 310 Type 310Cb. Type 310Mo.	Type 311	Type 316 Type 316Cb.	Type 317	Type 329	Type 330	Type 347	Type 410	Type 430	Type 442	Type 446	Type 502	Armorare Type B Amorare Type N
Arcos Corp. Chromend*	K Stainlend K	HC 25-12Cb. Stainlend HC	HCN 25-20Cb. 25-20Mo.	HN	K-Mo. K-Mo. Cb.	18-8Mo.	25-3Mo.	15-35	19-9Cb.	12	16	18	28	502	Chromang
Champion Rivet Co.	Type 308	Type 309 Type 309Cb.	Type 310 Type 310Cb. Type 310Mo.	Type 311	Type 316 Type 316Cb.	Type 317	Type 329	Type 330	Type 347	Type 410	Type 430	Type 442	Type 446	Type 502	Armorod B
Crucible Steel Co. Rezistal*	KA-2-8	No. 3 No. 3Cb.	No. 7	No. 4	KA-2SMo.	KA-2SMo.	No. 329	No. 330	KA-2-8CB	No. 12	No. 17	No. 20	No. 27	Lo Cro 46Mo.	Armorize Mn
Harnischfeger Corp. Harstain*	18-8	25-12	25-20					18-8Cb.						Harni-chrome	AW-3C
Hollup Corp.	Type 18-8	Type 25-12	Type 25-20		Type 18-8Mo.	Type 18-8Mo.		Type 15-35	Type 18-8Cb.	Type 12-14Cr.	Type 16-18Cr.		Type 28Cr.	Type 4-6Cr.	
Lincoln Electric Co. Stainweld*	A7	B	D		C	C			A5						
Maurath, Inc.	Type 304	Type 309 Type 309Cb.	Type 310	Type 311	Type 316 Type 316Cb.	Type 317	Type 329	Type 330	Type 347	Type 410	Type 430	Type 442	Type 446	Type 502	
McKay Co.	18-8	25-12	25-20		18-8Mo.	18-8Mo.		35-15	18-8Cb.	12% Chrome	16% Chrome	18% Chrome			Armorloy A-5 Armorloy 8-AM
Metal & Thermit Corp. Murex*	18-8		25-20		18-8Mo.	18-8Mo.									Stainless Mn.
Page Steel & Wire Allegheny*	19-9	25-12	25-20		18-8Mo.	18-8Mo.		15-35	18-8Cb.	12% Cr.	16% Cr.			4-6Cr.	19-9 Modified
A. O. Smith Corp.	SW-162	SW-166 SW-167	SW-159		SW-160	SW-161			SW-157	SW-153	SW-154			SW-151	SW-164

*Trade Name Used As Prefix

WHY G-E dry-type transformer

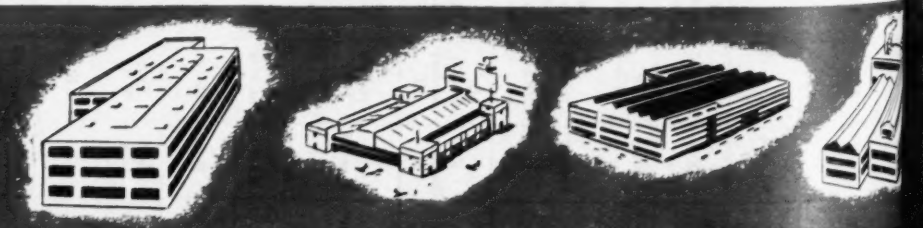




At a light-metals plant in Pittsburgh—This 2000-kva, 4160- to 480-volt unit substation is one of five such installations at this plant. (The enclosing fence is to prevent tampering with controls.) Compare the metal-enclosed construction of this dry-type equipment with conventional open-screen designs.

Good looks is a standard feature of all G-E dry-type, load-center unit substations. Such units are "naturals" for distribution revamping programs because, if you so desire, you can buy them one block at a time and still end up with a completely modern co-ordinated system—a system in which the self protection of each substation confines most troubles to a small area and prevents crippling plant outages. Available in ratings from 200 to 2000 kva, 601 to 15,000 volts.

DRY-TYPE TRANSFORMERS AND UNIT SUBSTATIONS



IN USE FROM COAST TO COAST

ve won wide acceptance

1. These ultramodern, dry-type distribution transformers are designed to meet **AIEE Standards No. 1 for Class B insulation, with 130 C maximum hot-spot temperature in a maximum ambient of 40 C. They also meet ASA Standards C-57.1, which limit the observable temperature rise to 80 C.**

2. **Because they meet industry standards for hot-spot temperature, G-E dry-type transformers are better suited to handle emergency overloads than units designed to higher temperatures. Longer life under severe service conditions is the inevitable result.**

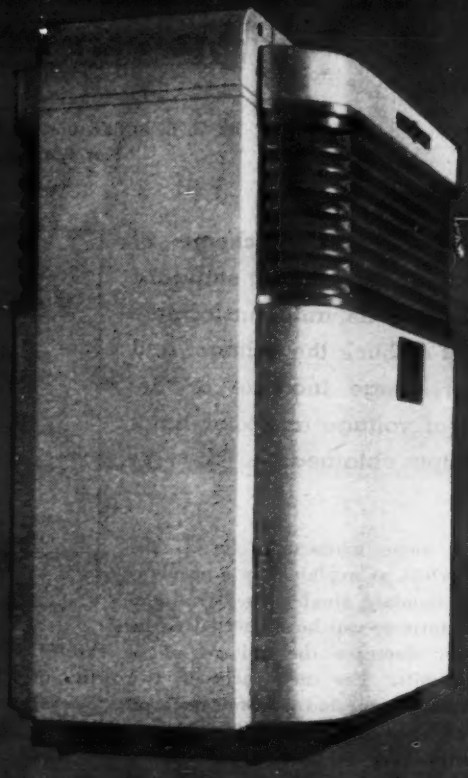
3. **Housings are designed for utility, and are attractive in appearance.**

4. **Completely metal-enclosed construction prevents rods and wires from being accidentally pushed into the live parts.**

5. **There are no exposed live parts, such as bushings, that would lessen safety and make a fence mandatory.**

6. **Cable terminal compartments are completely removable, so the high-voltage and low-voltage cables can be made up and the unit slid into place between them without the use of a crane or elaborate hoisting and jacking facilities.**

7. **Transformer side plates are readily removable to facilitate inspection and cleaning of the core and coils.**



Styled dry-type G-E distribution transformers are available for use on 601- to 15,000-volt primary circuits, in ratings from 100 to 2000 kva.

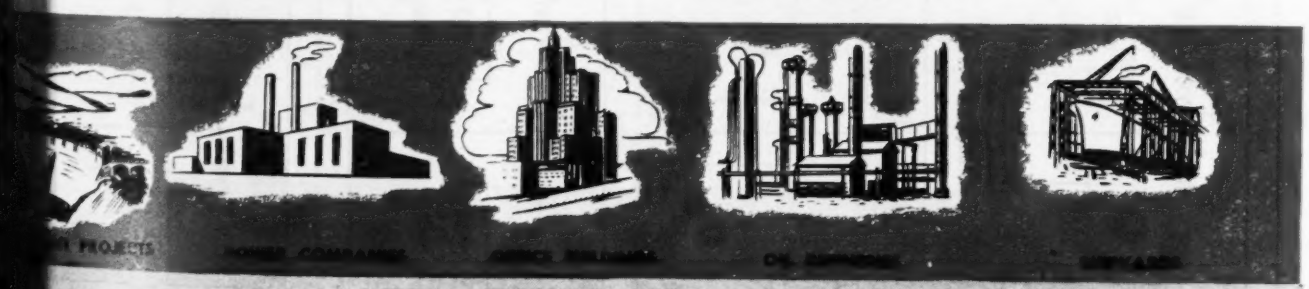
If you prefer dry-type designs, you will find these ultramodern dry-type transformers ideal for modernizing your plant's power system.

Their trim good looks, their safety, and ease of installation make dry-type units "at home" anywhere in your plant.

They fit right in with the economic good sense of *load-center power distribution*, which offers savings in installation cost, power, and assurance of full voltage at every lamp and machine.

When these transformers are a part of unit substations, the interrupting capacity of the substation switchgear section is exactly matched (electrically, mechanically, thermally) with the transformer capacity. It is adequate for even the most severe short circuits.

Ask for Bulletin GEA-3592A (load-center unit substations); Bulletin GEA-3714B (dry-type distribution transformers). *General Electric Company, Schenectady 5, N. Y.*



GENERAL ELECTRIC

BUY WAR BONDS

HOW TO USE SIGN-LIGHTING TRANSFORMERS FOR BOOSTING OR BUCKING THE VOLTAGE OF THREE-PHASE CIRCUITS

By C. E. BURKE and H. K. PRITCHARD Specialty Transformer Section, Fort Wayne (Ind.) Works, General Electric Co.

Tabulation includes scheme of connections for utilizing standard transformers as autotransformers to boost or buck the voltage, and the percentage increase or decrease of voltage and total bank kva. output obtained.

(1) Nominal Circuit Voltage	(2) Transformers Connected to	(3) Percent Change of Circuit Voltage	(4) Connection Diagram Fig. No.	(5) Kva. Output* in % of Bank† Nameplate Rating
115	Boost	10	1	866
	Boost	20	2	433
	Buck	10	3	866
	Buck	20	4	433
230	Boost	5	5	1733
	Boost	10	6	866
	Buck	5	7	1733
	Buck	10	8	866

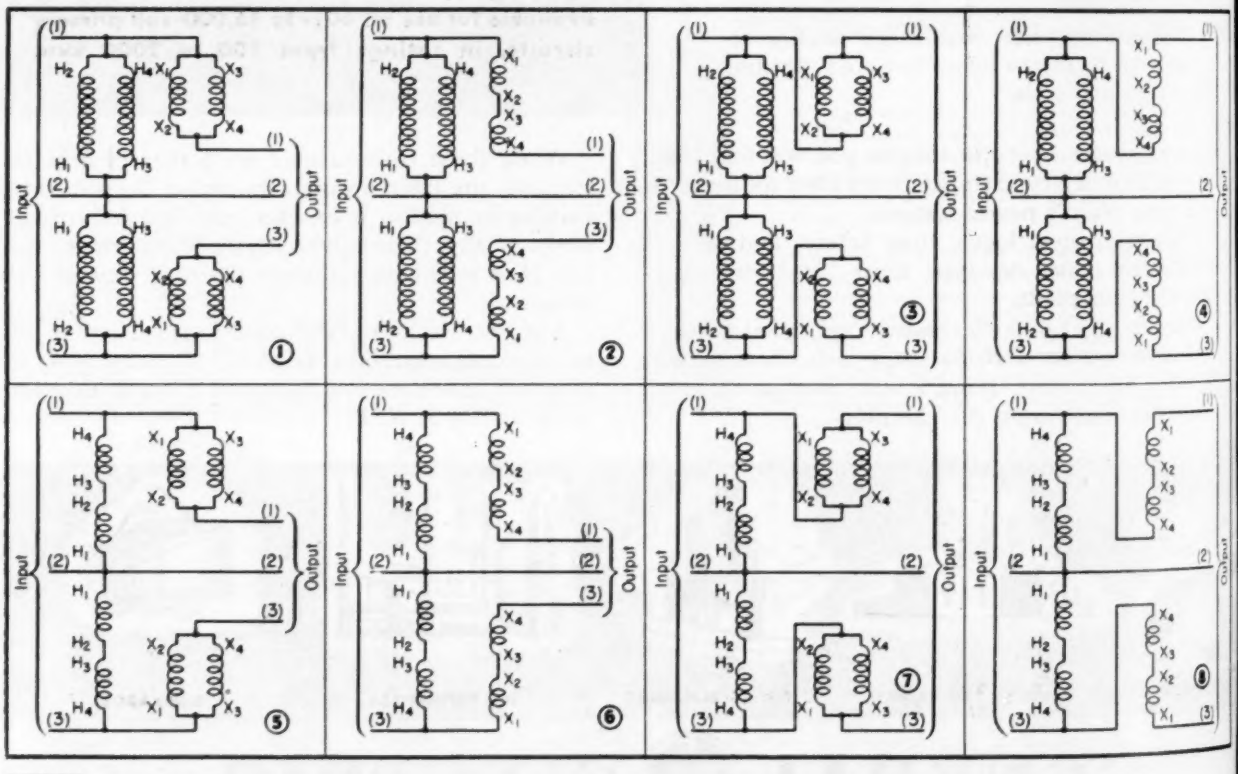
* Kva. output when output voltage equals nominal circuit voltage (Col. 1). When output voltage is different from nominal circuit voltage, multiply percent values of Col. 5 by ratio of actual output voltage to nominal circuit voltage (Col. 1).

† A bank consists of two transformers of same rating. Thus, bank nameplate rating is two times kva rating of one unit.

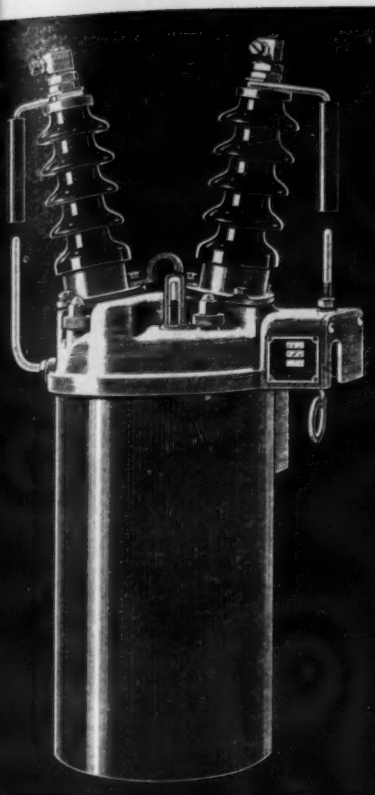
In the same manner as for single-phase circuits, as explained in a previous article,* standard single-phase sign-lighting transformers can be connected to increase or decrease the voltage of 3-phase circuits. For such purposes, two transformers connected as autotransformers in an open-delta bank are employed.

Accompanying table is applicable to standard single-phase transformers for 60 cycles, 115/230-11.5/23 volts, and capacities of 0.25 to 5.0 kva.; also for similar 50-cycle ratings and a 25-cycle line up to and including 2 kva.

Standard transformers rated 115/230—32 volts can be used to change the voltage of 115-volt nominal and 230-volt nominal 3-phase circuits by 27.8 percent and 13.9 percent, respectively. The kva. outputs (Col. 5) will be 312 percent and 724 percent, respectively, of the bank nameplate rating.



* ELECTRICAL WORLD, June 9, 1945, page 132.



KYLE

Oil Circuit Reclosers

Kyle Automatic Oil Circuit Reclosers at strategic points on your lines can be counted on to isolate permanent faults to the shortest possible branches . . . keep the revenue producing current going to the main lines and all unaffected branches.

These dual operating characteristics, as exemplified in the Type "H" Kyle Automatic Oil Circuit Recloser, provide:

1. *Fast Opening* of the Recloser on the *First* and *Second* Operations.
2. *Time Delay Opening* of the Recloser on the *Third* and *Fourth* Operations.

Only a Kyle Automatic Oil Circuit Recloser with these dual operating characteristics will clear all temporary faults and also permit the use of additional sectionalizing devices to isolate permanent line faults.

Advantages of Dual Operating Characteristics

1. All temporary line faults, which comprise 90% of line disturbances are cleared AUTOMATICALLY.
2. Service continuity is increased with resultant higher revenue and better customer satisfaction.
3. Outages are confined to the smallest possible area.

Ask your Line Material Representative to furnish you with complete details on the Type "H" Kyle Automatic Circuit Recloser and how it can be used most effectively to protect your system.

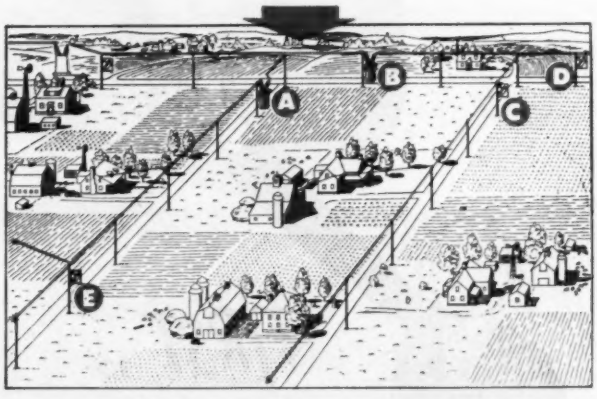
RECLOSER RATINGS: Volts—2400 to 15,000; Amperes—5 to 50; Tripping Current—10 to 100 Amperes; Interrupting Current—150 to 1200 Amperes.

HERE'S HOW IT WORKS:

To protect branch lines from a substation feeder, Kyle Reclosers are located at "A" and "B" to isolate the branches from the main line. Fuses are used on the load side of the Kyle Recloser at "C", "D", and "E" to sectionalize the branch line.

If a fault beyond the sectionalizing fuses is not cleared on the first two operations of the Recloser, it is considered of a permanent nature and the branch line should be isolated by the blowing of the sectionalizing fuse. The Type "H" Kyle Automatic Circuit Recloser permits coordination with the sectionalizing fuse on its third and fourth operations, so that the fuse is blown before the Recloser locks out.

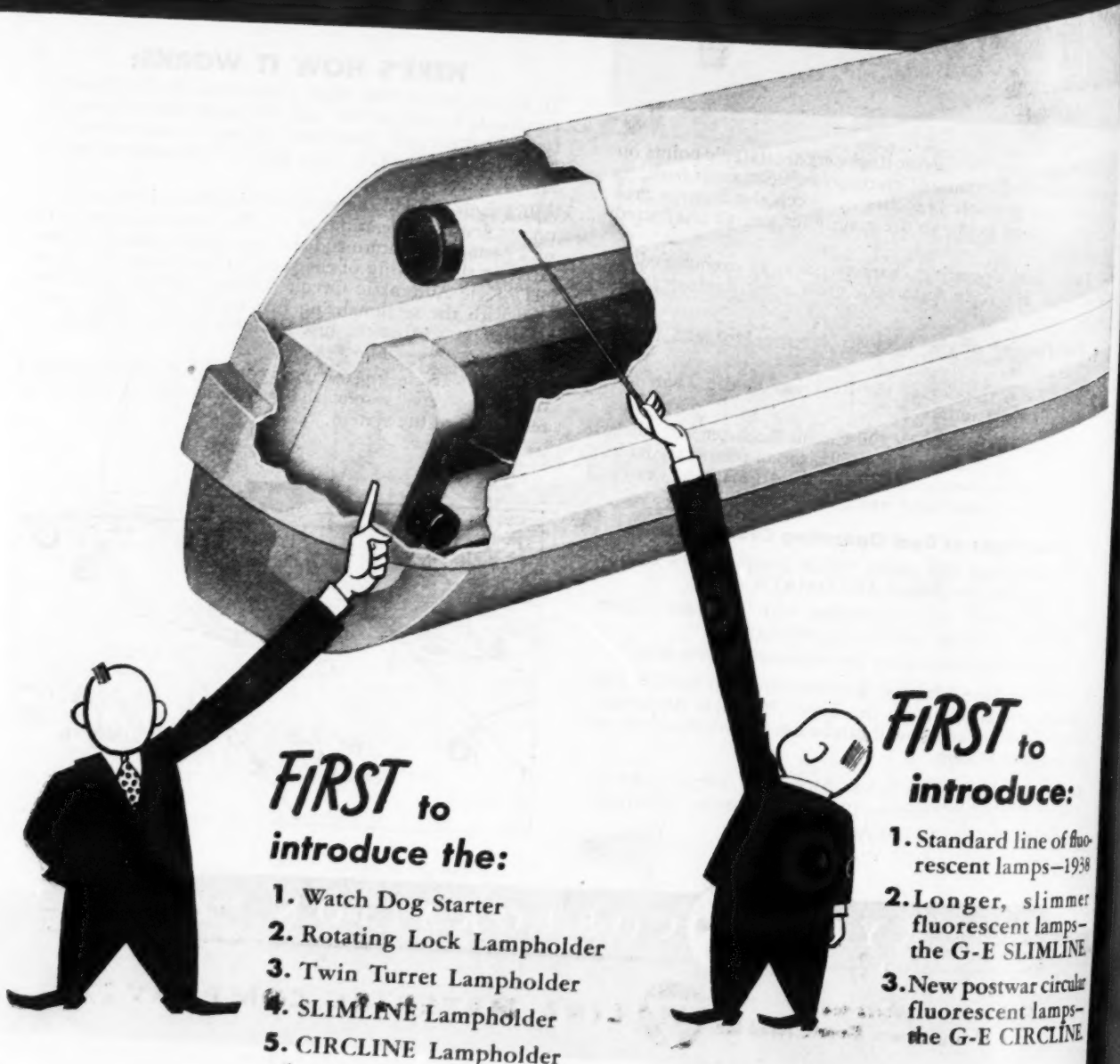
In this way, the line outage is confined to a small portion of the protected system and service is maintained to the remainder of the system.



MADE BY KYLE CORPORATION SOUTH MILWAUKEE WISCONSIN

KYLE Circuit Breakers are Designed and Manufactured for LINE MATERIAL COMPANY MILWAUKEE WISCONSIN

FIRSTS IN FLUORESCENT mean more business for you



FIRST to introduce the:

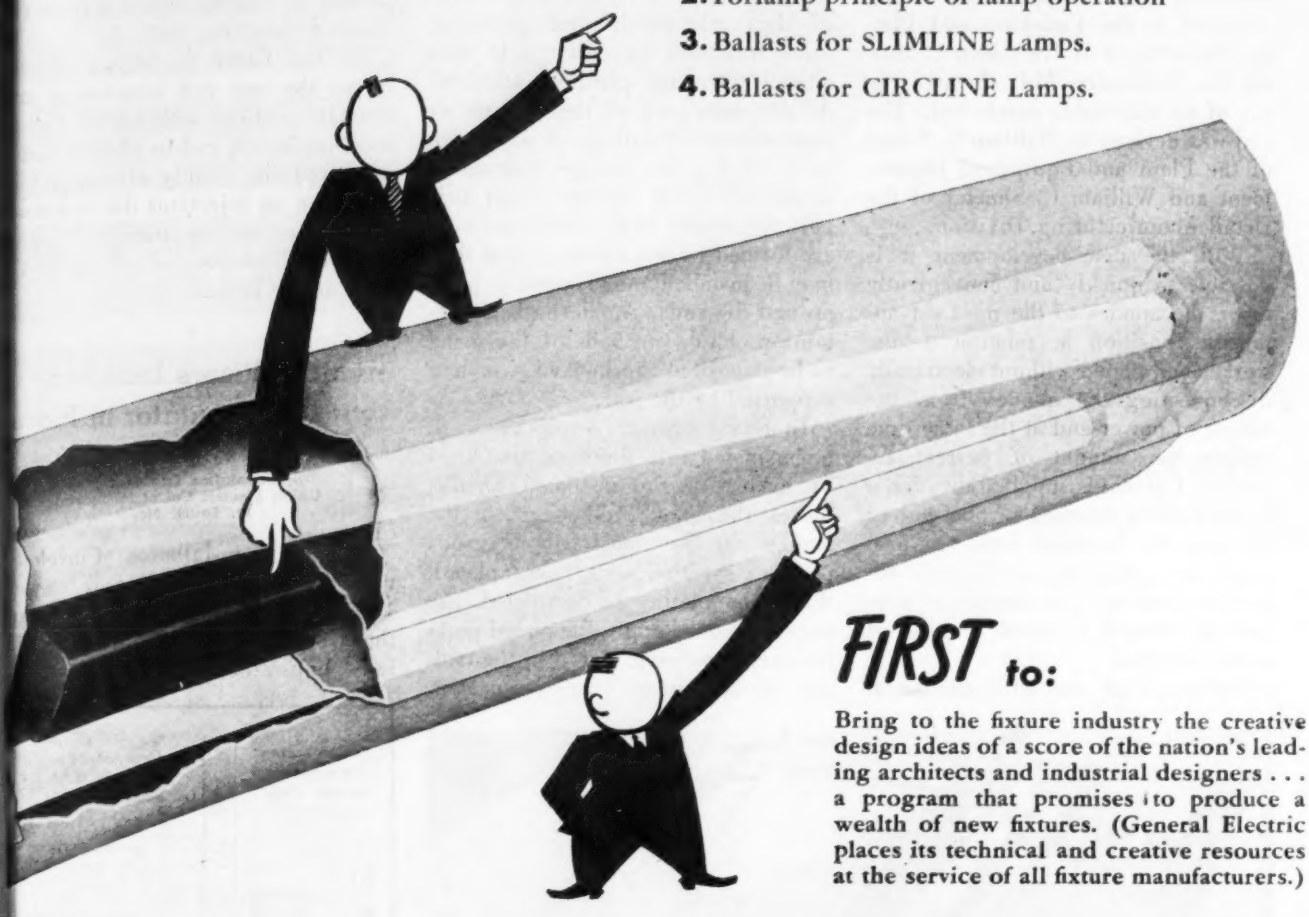
1. Watch Dog Starter
2. Rotating Lock Lampholder
3. Twin Turret Lampholder
4. SLIMLINE Lampholder
5. CIRCLINE Lampholder

FIRST to introduce:

1. Standard line of fluorescent lamps—1938
2. Longer, slimmer fluorescent lamps—the G-E SLIMLINE
3. New postwar circular fluorescent lamps—the G-E CIRCLINE

FIRST to develop:

1. Tulamp principle of lamp operation
2. Forlamp principle of lamp operation
3. Ballasts for SLIMLINE Lamps.
4. Ballasts for CIRCLINE Lamps.



FIRST to:

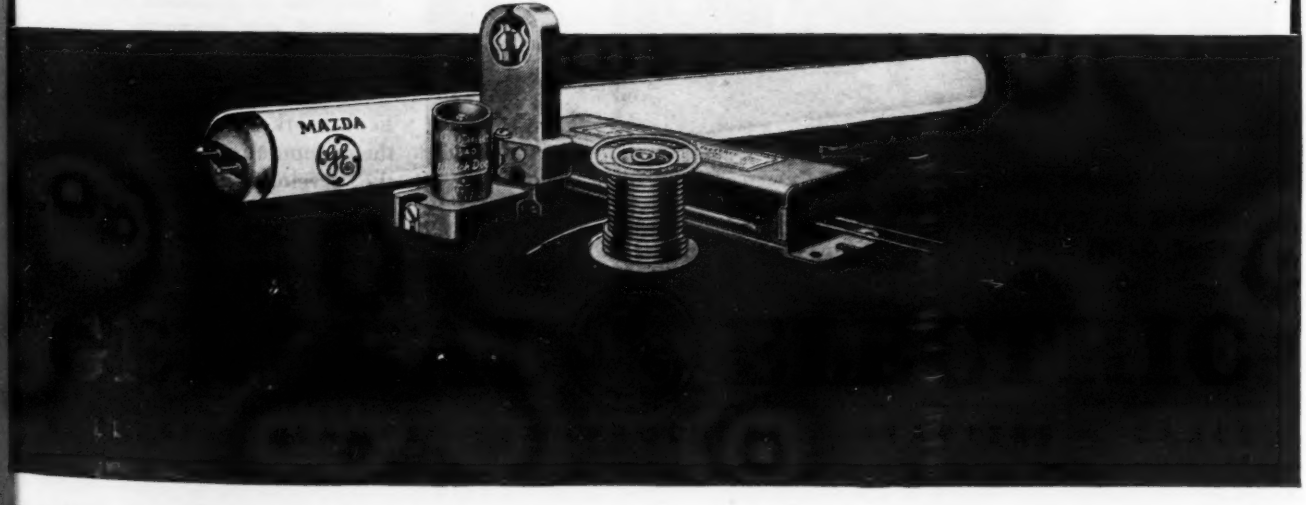
Bring to the fixture industry the creative design ideas of a score of the nation's leading architects and industrial designers . . . a program that promises to produce a wealth of new fixtures. (General Electric places its technical and creative resources at the service of all fixture manufacturers.)

You'll do a bigger and more profitable lighting business as a result of General Electric research. These achievements in fluorescent lighting will:

1—Give your customers simpler, more reliable performance.

2—Cost less, and make it possible for your customers to buy higher and higher levels of lighting.

3—Expand its field of application to cover many new uses.



Adjustable Anode Rod Facilitates Plating

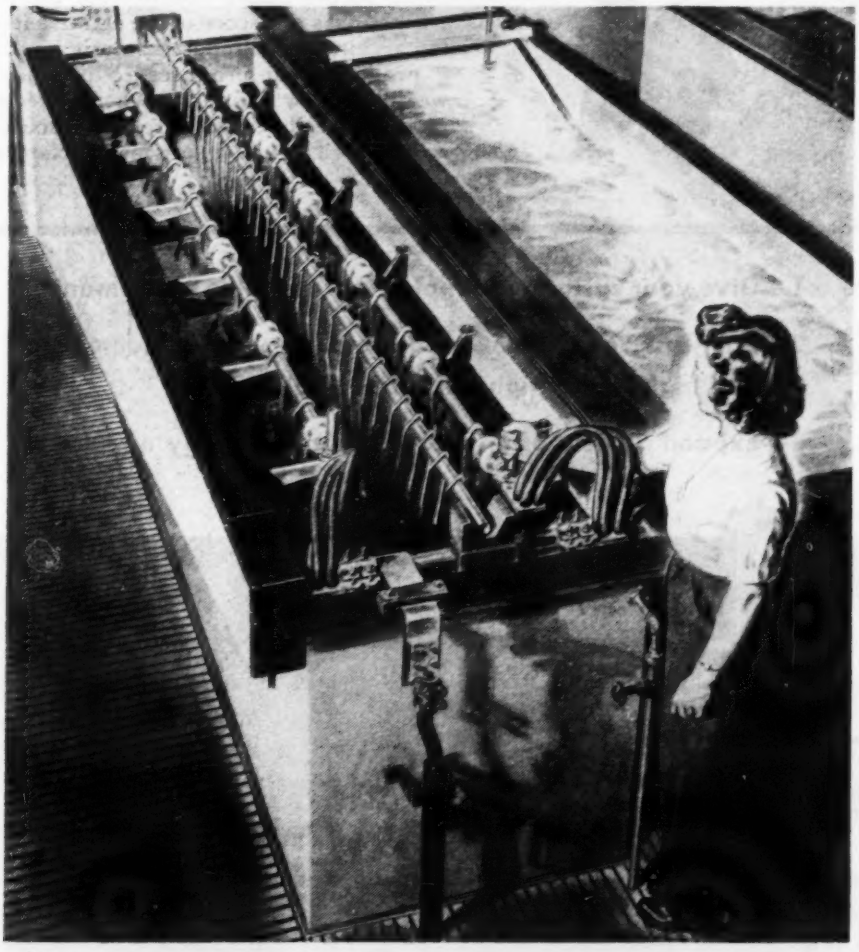
Faster plating of irregularly shaped parts and more uniform and even tempered metal deposits are being achieved in the Finishing and Plating Department of The Glenn L. Martin Co., Baltimore, Md., through the use of an adjustable anode rod. The rod was devised by William G. Evans of the Plant and Equipment Department and William C. Shaefer of the Detail Manufacturing Division.

With the new development it is possible to quickly and conveniently move the anodes to the most advantageous position in relation to the work being plated without electrically disconnecting the anodes from the source of power and at the same time reduce the amount of current required. Current is supplied through a flexible cable attached to one end of the rod. An insulated handle is provided to permit the operator to adjust the rod which is capable of supporting several hundred pounds of anode material.

Designed for use with elongated, mass-production plating tanks, the new installation consists of brackets welded, bolted or riveted to the walls of the tank which steel plates or arms insulated on either side with phenol fiber are pivotally attached. At the outer end of these plates or arms are swivel fittings on which are mounted annular clamps containing insulators which surround and support the anode rod. The insulators are formed in two halves so that they may be installed and clamped in place around the rod. Anode baskets containing chunks or balls of the metal to be deposited are hooked over and supported by the rod.

In use the operator lowers the work to be plated into the tank, and then by means of the insulated handle, moves the anode rod to place the anodes in the most advantageous position for the parts being plated. When the plating is completed, the rods are moved apart, the plated parts removed, new ones placed in the tank and the adjustment process repeated. It makes little difference whether one batch is similar to another, and the whole adjustment process requires only seconds instead of the long periods of time consumed with previous rod mounting methods.

In The Glenn L. Martin plating rooms the new rod installations are already credited with saving countless man-hours, and in addition, have improved the quality of output and cut down on rejections due to coarse textured or uneven coatings. Designs for the adjustable rod will be available under license.



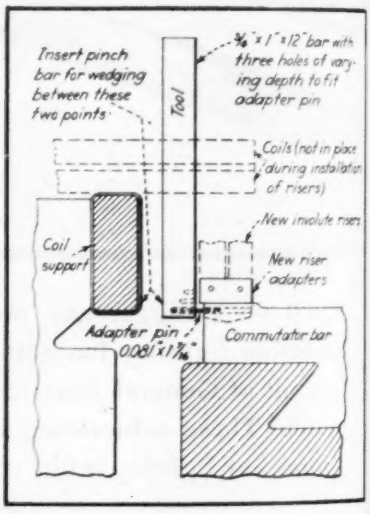
ANODE ROD IS ADJUSTED to accommodate several types of plating work

•

Involute Risers Installed with Commutator in Place

M. R. WALLIN
Substation Engineer
Union Electric Co. of Missouri
St. Louis, Mo.

During the installation of involute-type commutator riser bars on an 1,875-kw., 250-volt, d.c. generator by the Union Electric Co. of Missouri in St. Louis, the time, expense and difficult work attendant to removal of the commutator were avoided through the development of a small special tool for inserting the keying pins in the riser bar adapters.


Insert pinch bar for wedging between these two points
Tool
3/8" x 1" x 12" bar with three holes of varying depth to fit adapter pin
Coils (not in place during installation of risers)
New involute risers
Coil support
New riser adapters
Adapter pin .008" x 1 3/16"
Commutator bar

REMOVAL of commutator during installation of new commutator risers was avoided by use of special tool to force keying pin into riser bar adapters

The attached sketch shows the general assembly of the adapter in the commutator bar and the keying pin in the adapter. Because it was necessary to install longer armature coils for the new risers, the old coils were removed before the risers were put in. There was only about 2 in. of

No gathering or matching of parts . . . the type EA fuse cutout is packaged complete . . ready to install . . . as a unit. Available in 50 and 100 ampere ratings, 5 and 7.5 kv.

IT'S ALL IN ONE PACKAGE

READY FOR INSTALLATION WHEN YOU GET IT

Type EA fuse cutout cartons can be stored on your service trucks with the assurance that when your trucks get on location your men have everything they need. The type EA cutout package eliminates separate storage of brackets—for any type of crossarm mounting—and greatly simplifies accounting and inventory.

Its component parts are also 100 per cent interchangeable. The same housing will take any of three doors: the drop-out fuse door; the nondrop-out fuse door; and the disconnect blade door. The Moldarta door will fit correctly in any housing, because housings are accurately dimensioned Prestite porcelain.

This combination of unit delivery and interchangeability of component parts assures minimum handling and easy fuse replacement. For complete information write for D. D. 38-625, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60582

ONLY THE WESTINGHOUSE TYPE EA FUSE CUTOUT OFFERS THIS COMBINATION OF ADVANTAGES:

- Positive drop-out action
- Complete interchangeability
- Complete hookstick operation
- Prestite housing
- Fewer joints in current path
- Low heating losses
- Nonswelling fuse tube
- Easy fuse renewal . . . without tools
- Large hook-eye on door

Westinghouse TYPE EA FUSE CUTOUT

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

working space, in a longitudinal direction, between the inner end of the commutator bars and the coil support. Previously this was considered insufficient space for inserting the pins, since appreciable pressure was necessary to force them into place prior to soldering. Moreover, the pins were only 0.081-in. diameter and could be bent easily.

These difficulties were overcome, however, through the use of a ¾-in. by 1-in. by 12-in. iron bar having three holes, slightly larger in diameter than the pin, bored to varying depths near one end. By inserting the pin first in the deepest hole and applying pressure with a small pinch bar between the back of the tool and the coil support, it was possible to get the pin started into place without bending. When the pin had been driven in as far as the tool permitted the process was repeated placing the pin in successively shallower holes of the tool until only about ¼ in. of the pin projected. The pin could then be completely driven home with a wedging or pinch bar.

This tool was developed for this particular job by the service organization of the manufacturer of the machine, who handled most of the work in connection with the installation of the risers. The generator involved was one of two identical units on a three-unit, 3,750-kw., motor-generator set. In an earlier installation of similar risers on the other generator the commutator was partially slipped off the shaft. Due to lack of working space and the tightness of the commutator on the shaft, this proved to be an extremely difficult job. All this heavy and difficult work was avoided on the second machine through use of the tool described.

•

Alarm Warns of Drop in Condenser Vacuum

When the vacuum in condensers at Ohio River Station of Southern Indiana Gas & Electric Co., Evansville, drops below 5 in. Hg. abs. a vacuum-actuated, Mercoid-type, tilt-tube switch energizes an alarm to give operators advance warning of possible loss of vacuum, so that steps can be taken in time to prevent exhausting steam to atmosphere.

To keep the alarm from sounding continuously while machines are being brought "on" or "off" the line and yet provide visible indication, a transfer switch has been provided which connects the tilt-tube with a signal lamp instead of the horn. Thus, when a machine is to be started up and brought on the line the toggle switch is thrown to "off" position and the signal light on the turbine gage board burns continuously until condenser vacuum builds up to 5 in. Hg. abs. At this point the light goes out automatically and the transfer switch may be tripped to the "on" position. Any subsequent drop in condenser vacuum below the preset critical value will cause the audible alarm to sound. When a machine is to be shut down the procedure is reversed.

This signal scheme was developed by Noel Baun, chief electrician at the Ohio River station.

• • •

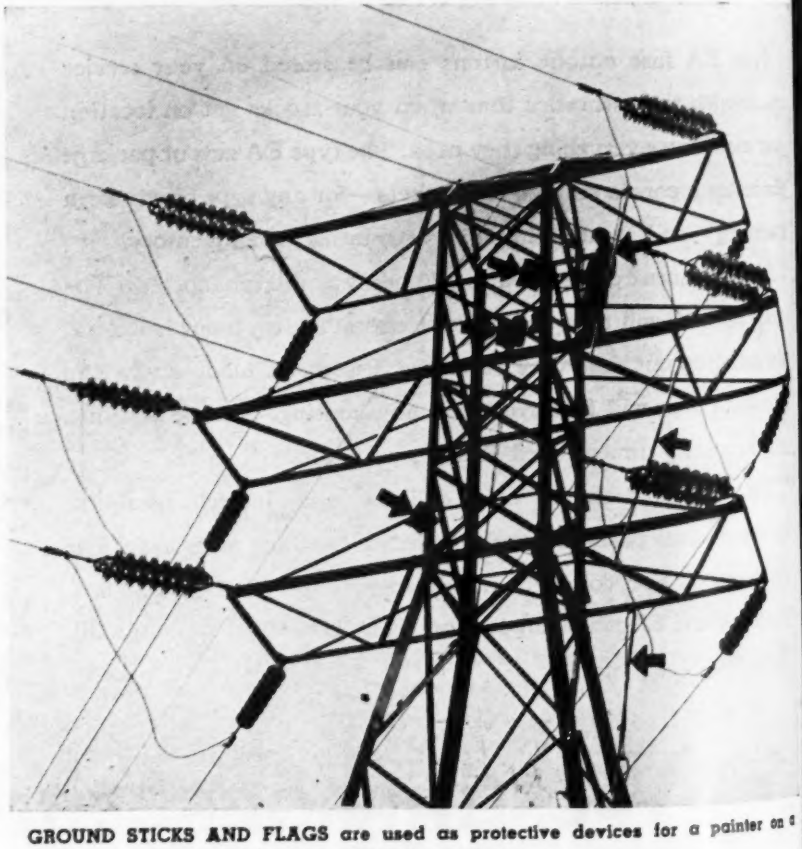
Safety Precautions when Painting "Hot" Towers

Approximately 15,000 steel towers are required to carry more than 3,100 circuit-miles of transmission lines for the Buffalo, Niagara and Eastern Power Corp. and associated companies. So that power will be kept flowing to war industries, it is often necessary to paint the towers while high-voltage circuits on one side are alive. Consequently numerous safety precautions must be taken before a painter is sent aloft on a tower carrying a live circuit.

The painting job must be planned with exacting care. Here is a brief outline for protection of the painters. Load dispatchers are notified that a certain section of transmission line is to be painted. A "mark-up" must be arranged—that is, written records and instructions as to when, where and how a line will be cut from service. Signs are posted at the substation and the switching yard. The switches controlling the line are opened at a specified time and locked so they can be closed only by the authorized persons at the specified time.

Switches are opened at each end of the circuit, but this doesn't render the line harmless. Power in the live circuits on one side of the tower may "induce" current into the "dead" wires.

So linemen mount the towers, attach ground sticks to each wire of the



GROUND STICKS AND FLAGS are used as protective devices for a painter on a 60-ft. tower on a Buffalo-Lockport transmission line

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications.

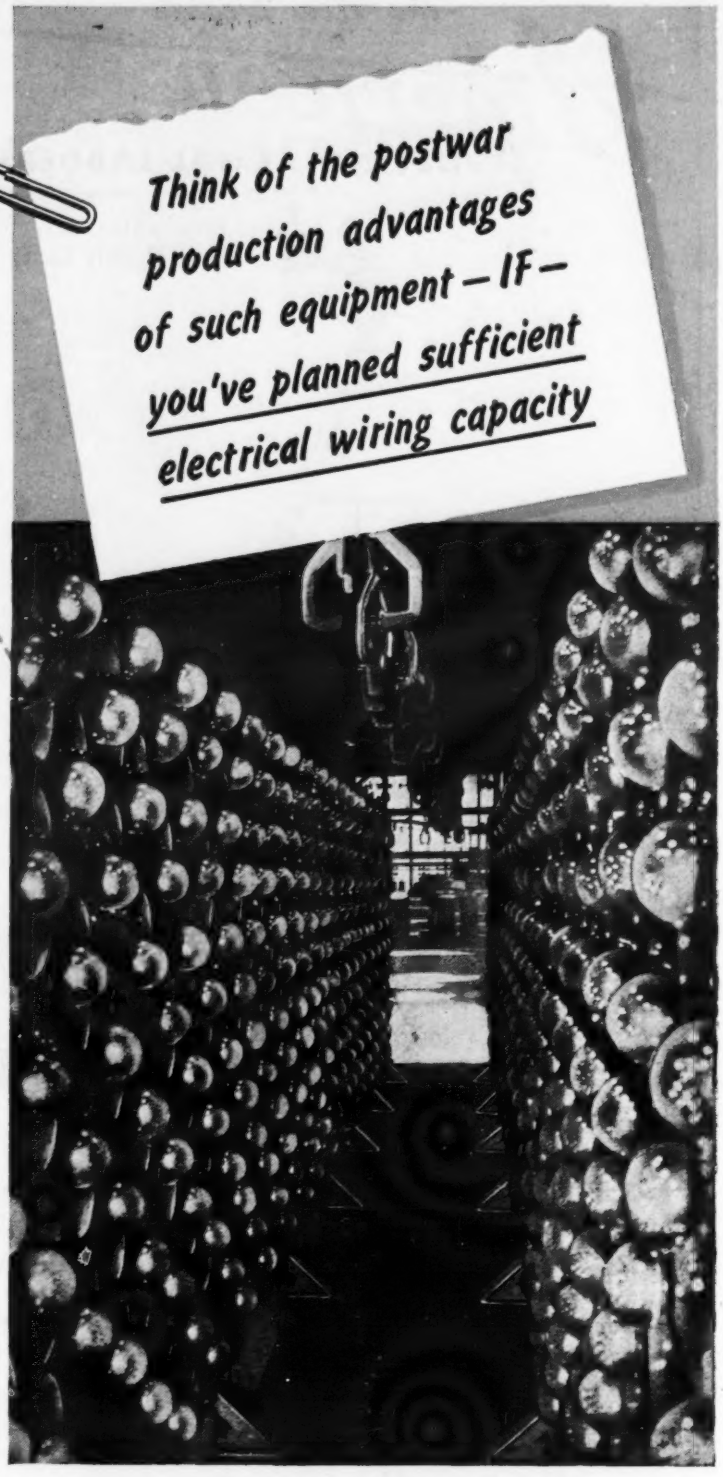
Look over this ADVANCED TYPE INFRA-RED OVEN

NATURALLY YOU'LL WANT the production advantages of tomorrow's new, improved electrical equipment. But so often advanced machines fail to work efficiently because plants are electrically underwired.

What about *your* postwar wiring set-up? Is it planned by *past* standards or in anticipation of *future* needs?

Don't take chances—Wire Ahead! Foresighted wiring now can save expensive alterations later—costly downtime—lost production and good will.

Today—call in your consulting or plant power engineer, electrical contractor or power salesman. They know wiring capacity must meet the coming expansion in electrical usage. They too will say—Wire Ahead!


Think of the postwar production advantages of such equipment—IF—you've planned sufficient electrical wiring capacity

Fourteen banks with 36 lamps each give this improved infra-red oven tremendous drying capacity.

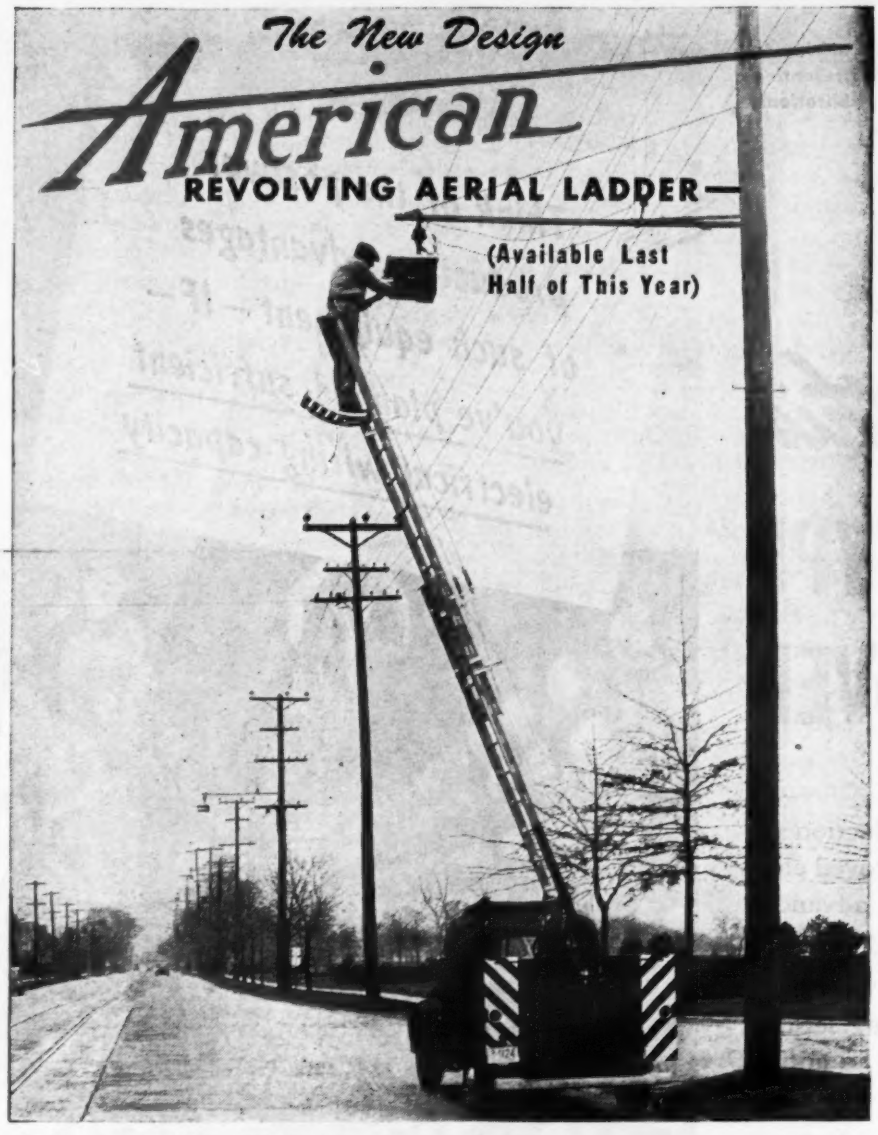
ANACONDA

ANACONDA WIRE & CABLE COMPANY

GENERAL OFFICES: 25 Broadway, New York City 4 — *Subsidiary of Anaconda Copper Mining Company*

CHICAGO OFFICE: 20 North Wacker Drive 6 • Sales Offices in Principal Cities

Check Your Wiring Plans Before They Check You!



Meets Fully All Requirements for:—

SERVICING Street, Highway and Signal Lights...Trimming Trees ...Maintenance and Line Construction Work and Emergency Calls.

Here's equipment that assures real savings of time, energy and money — One man operated, swiftly and accurately spotted, extends over parked cars, will not interfere with traffic and affords operator maximum safety and convenience.

"AMERICAN" Revolving Aerial Ladders have always been "Tops" in Engineering and Construction and the improvements incorporated in the new design assure the maximum in efficiency, ease of handling and low cost operation.

Important in the improvements is the new spring counter-balancing design, which effectively balances the ladder in all positions, so that with a slight uniform force it can be swiftly, smoothly and easily erected, regardless of angle of ladder or frame.

Write for details and specification.

BUY MORE WAR BONDS . . . and HOLD THOSE YOU HAVE

THE American COACH & BODY CO.

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

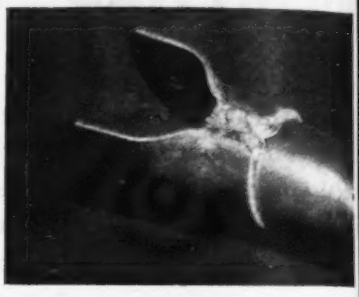
"dead" circuit, ground those wires at the tower to carry off induced currents. Then a further set of safety precautions has to be followed. When the painter goes up the tower, he attaches a red "danger" flag to the "hot" side of the tower. These mark the boundaries, set a safety zone within which he can work.

Belted to the steel the painter starts his maintenance job. An average transmission tower requires six gallons of red lead and six gallons of paint.

•

Alloy Regalvanizes Welded Galvanizing

Galvanized structures and sheets from which the original galvanizing is burned off during the welding process are successfully regalvanized on the job with an alloy called "Galv-Weld" to prevent corrosion. This



WELD of galvanized pipe and yoke has been regalvanized with Galv-Weld alloy for rust and corrosion prevention

method of regalvanizing can be applied to seams made by arc or gas welding. The intense heat of welding burns off the coating of zinc and exposes the bare metal adjacent to the weld. In most cases it has been impractical to regalvanize the bare spots by the hot-dip method which requires a heated receptacle containing molten zinc and which is impossible in the case of large structures.

After a weld is made it is rubbed briskly while still red hot with a brass, wire-bristled brush to clean the weld. Then a bar of the low-melting alloy is rubbed along the hot weld and over the adjacent surface to fix a deposit of the alloy and while this galvanizing alloy is in a liquid state the wire brush is again applied to spread the alloy evenly over the entire weld. Although this galvanizing alloy can be applied by utilizing the stored up heat in the welded sections, regalvanizing can also be done by re-heating the weld to approximately 600

"Under any name it's a Fine Product"... says Rōmey

When you order Rome Synthinol Thermoplastic Insulated Wires, the new type designation for SN, for dry locations, is now T, and SNW, for wet locations, has been changed to TW.

These insulations combine a wide range of advantages, such as high resistance to moisture, acids, and corrosion, excellent dielectric strength, toughness.

The finished wire is free stripping, is available in many bright colors, is small in diameter, and has a smooth and lubricated surface for easy pulling.

We will gladly send samples and price sheets.

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CHICAGO
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PITTSBURGH
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Phone—Locust 7743

CLEVELAND
850 Euclid Avenue, Zone 14
Phone—Cherry 5957

LOS ANGELES
327 East 4th Street, Zone 13
Phone—Mutual 5093

DETROIT
New Center Bldg., Zone 2
Phone—Trinity 2-7578

WASHINGTON
14th & N. Y. Ave. N.W., Zone 5
Phone—National 3934

BOSTON
Box 63, Marshfield Hills
Phone—Marshfield 41

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION
ROME • NEW YORK

G-E PYREX* PLUG FUSES

FOR BRANCH CIRCUIT PROTECTION

(3-30 Amp., 125 Volts)

USE these high quality plug fuses everywhere for branch circuit protection. Use them for replacements of all kinds. G-E Pyrex fuses are sturdy and will give lasting protection. *The Pyrex top* is one piece and heat resistant. *The base* is cold molded and keyed into the Pyrex top. There is little chance of its turning and damaging the link. *The shell* holding the Pyrex top and the base together is staked securely into the base. This construction provides strength in the fuse.

G-E Pyrex fuses are easy to use and have an insulated grip. Ratings can be read at two points: on the fuse link seen through a magnifying lens window and on the contact rivet at the base of the fuse. These fuses are packed in handy fuse dispenser cartons—five fuses to a carton.

For further information see the nearest G-E Merchandise Distributor or mail the coupon for a descriptive folder.

BUY WAR BONDS AND KEEP THEM

General Electric Company

Section D652-9, Appliance and Merchandise Dept.,

Bridgeport, Connecticut

Sirs: Please send me the folder on Pyrex Fuses

Name .....

Address .....

City ..... State .....

*Reg. U.S. Pat. Off.

GENERAL ELECTRIC

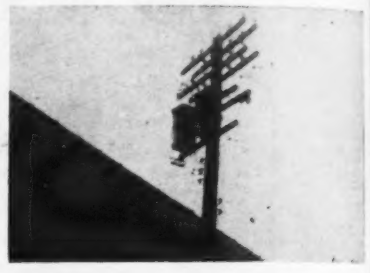
deg. F. The alloy itself melts at 450 deg.

The Galv-Weld process prior to the war was used as a secret technique. A free license is being granted on all government work by Galv-Weld Products, Dayton, Ohio, which holds the patent on the process.

•

Horizontal Rack Affords Secondary Wire Clearance

Confronted with the problem of obtaining secondary wire clearance over a building from a congested pole top led to the illustrated installation on the Tarentum, Pa., municipal system. The secondary rack is mounted at the extreme tip of the lower arm in a horizontal position. Leads from the sec-



STANDARD SECONDARY RACK mounted horizontally on arm tip clears wires over building by 2½ ft.

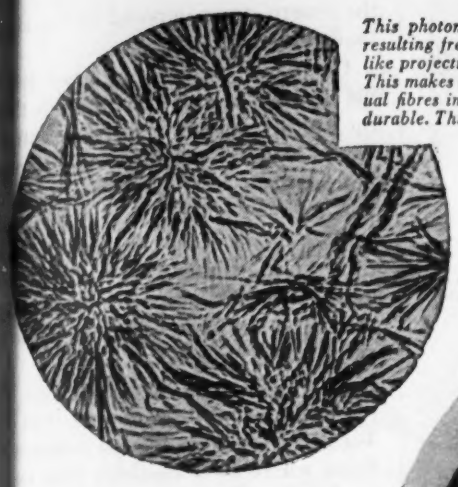
ondary bushings of the two 37½-kva. 2,300/220/110 volt, open delta connected transformers drop to the conventional mounted rack. From here the service tap rises to the horizontal rack, clearing the building by 2½ ft.

The horizontal rack is supported by through-bolt; the twisting moment is overcome by a 1-in. cold rolled steel bar which is wrapped around the arm and is bolted to the rack.

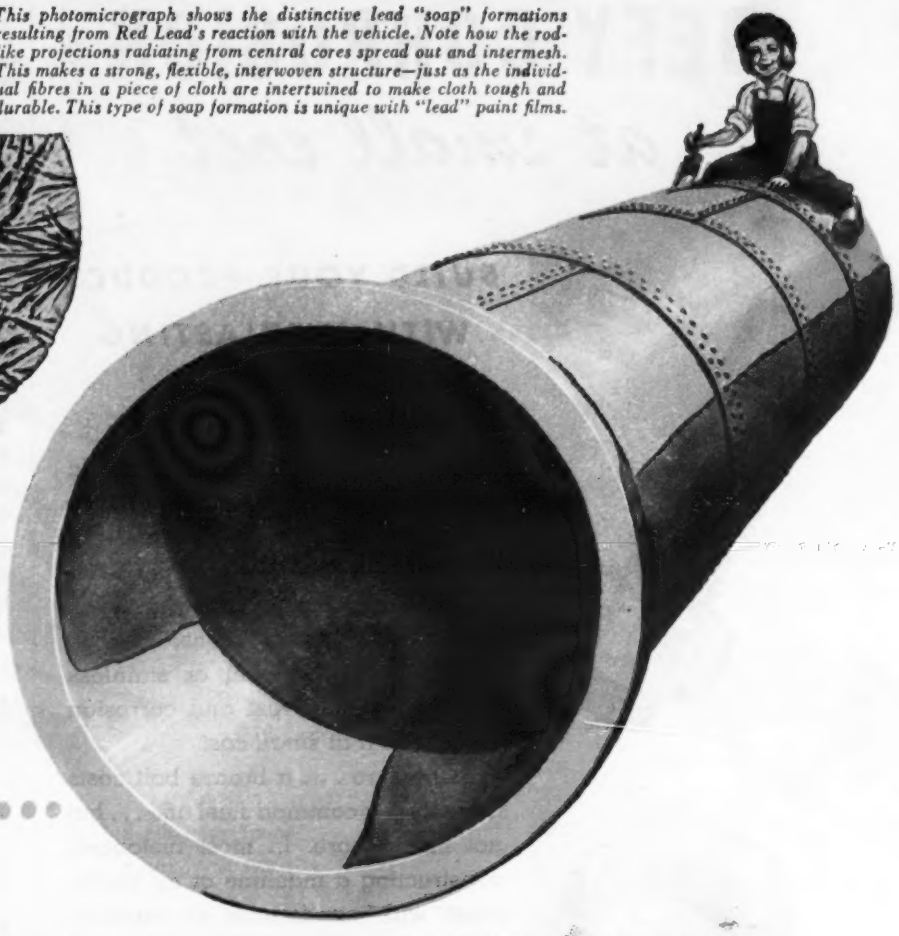
•

Storm Shows Virtue of Anti-Split Bolts

The virtue of using "anti-split" bolts in the outer ends of crossarms on distribution lines to force the breaking of wood insulator pins and so prevent the splitting of crossarms under heavy ice loads, was indicated by the experience of Oklahoma Gas & Electric Co. during a major ice storm this spring in the area of Durant, Okla. Restoration of service following this storm was complicated by the splitting of many crossarms under



This photomicrograph shows the distinctive lead "soap" formations resulting from Red Lead's reaction with the vehicle. Note how the rod-like projections radiating from central cores spread out and intermesh. This makes a strong, flexible, interwoven structure—just as the individual fibres in a piece of cloth are intertwined to make cloth tough and durable. This type of soap formation is unique with "lead" paint films.



unique LEAD SOAPS...

another important reason why RED LEAD means Extra Rust Protection

Why is Red Lead outstanding as a metal protector?

One of the major reasons is this pigment's remarkable ability to impart to the paint film strong, tough, intertwining lead "soap" formations—as shown in the photomicrograph above.

These unique lead "soaps" improve the paint film in many ways. For one thing, they form a dense, intermeshing matrix which restricts the passage of water through the film. And rusting does not take place without the presence of moisture.

For another, they *mechanically* reinforce the film, giving it extra *strength* and *toughness.*

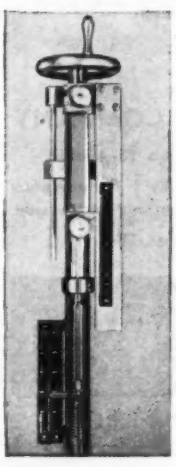
And again, Red Lead "soaps" contribute all-important *elasticity* — allowing movement along their intermeshing projections. This action helps prevent the ruptures to which a hard, unyielding film is subject. Moreover, when a paint film dries and ages, decomposition of the vehicle sets in. But, because of Red Lead's ability to combine with the decomposition products and form soaps, it increases both the durability of the paint film and its adhesion to the base metal.

Red Lead's extra strength, toughness and elasticity are demonstrated by the tensile strength test below and substantiated by exhaustive research and field service.

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify RED LEAD for All Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.



* * *

In this tensile strength tester a typical Red Lead paint film has been stretched 18% without breaking. In withstanding this elongation it has maintained a load of 920 grams. Any film that exhibits these characteristics has unusual strength, toughness and elasticity. As metals expand and contract only a fraction of one percent, this film would adhere under the most extreme conditions.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

Write for New Booklet—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas — ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

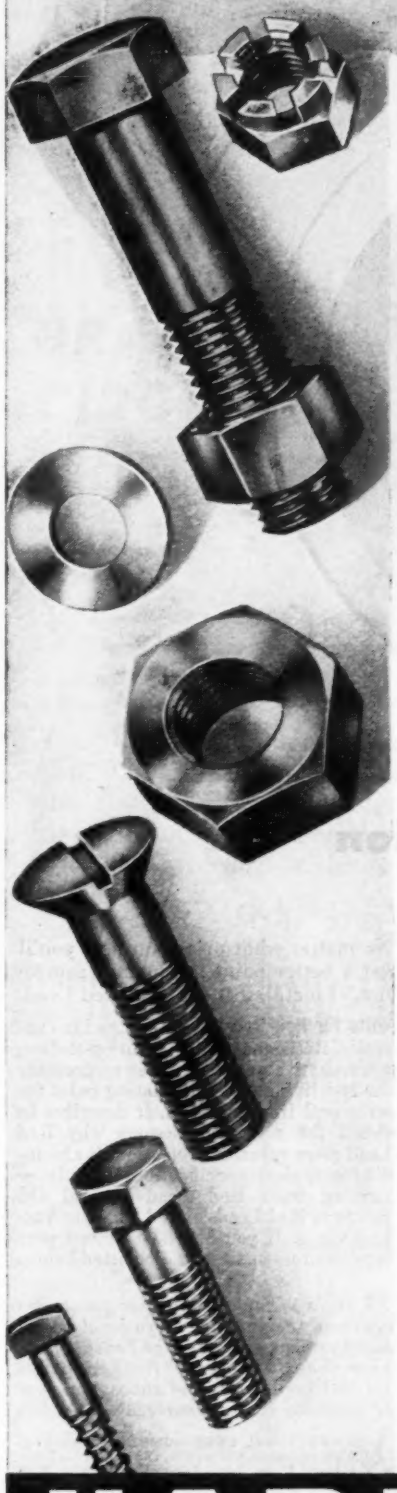
* * *

All types of metal protective paints are constantly being tested at National Lead's many proving grounds. The benefit of our extensive experience with Red Lead paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston, W. Va. (Evans Lead Division).

DUTCH BOY RED LEAD

DEFY CORROSION
at small cost



BUILD YOUR PRODUCT WITH EVERLASTING FASTENINGS

Your product must stand up in use. In many cases it will meet the destructive forces of rust and corrosion.

Forestall trouble! Use Harper Everlasting Fastenings. They're made of either brass, naval bronze, silicon bronze, copper, Monel or stainless steel. They defy rust and corrosion . . . and *do it at small cost.*

To be sure . . . a bronze bolt costs more than a common steel one . . . but not much more. In most instances, constructing a machine or an instrument with non-ferrous or stainless fastenings adds only pennies to the total cost. Percentage wise, the added expenditure is negligible. But the life of the product . . . the ability to "take it" . . . the probability of freedom from trouble are increased beyond measure.

4360 ITEMS IN STOCK

Harper is known as "Headquarters for Non-Ferrous and Stainless Fastenings" . . . carries large and complete stocks of 4360 different items and is continually adding others. Write for 1945 Catalog.

THE H. M. HARPER COMPANY

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the severe stress imposed by the sleet load.

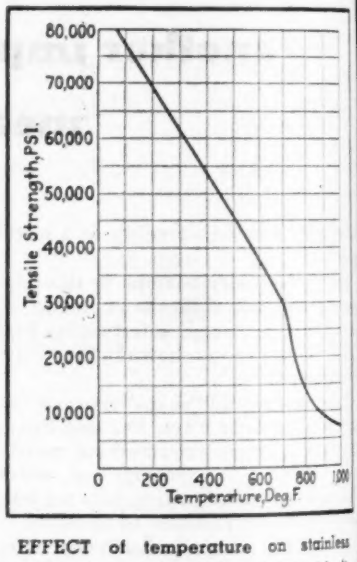
Company engineers returned from the storm area with the conviction that the use of anti-split bolts in the future would cause insulator pins to snap before stress in the arms reached the danger point. Replacement of broken pins would obviously make restoration of lines after such a storm quicker, easier and much less costly than was the case when the broken arms were replaced.

Anti-split bolts have been used by the Oklahoma utility for some time on 4-in. by 5-in. transmission crossarms. Even where steel insulator pins were used in wood arms the pins bent over without splitting many arms. In the transmission crossarms ½-in. by 5-in. machine bolts with round washers were installed 2 in. from the ends of the crossarms.

•

How Does Heat Affect Joint Strength?

Question of how heat affects the strength of a silver-soldered joint was studied in the laboratories of Handy and Harman, Bridgeport,



EFFECT of temperature on stainless steel silver-soldered butt joint with dimensions 0.625-in. by 0.0625-in.

Conn. Results of tests revealed that the strength falls off in a straight line curve with temperatures up to about 700 deg. F., at which point the decrease becomes much more rapid.

Accompanying curve shows the effect of temperature on the tensile strength of a stainless steel silver-soldered joint. The curve is typical of similar joints on other metals.

Why are there so many types of Fiberglas* Tapes?

Long before the war, engineers and designers had recognized Fiberglas' unique combination of characteristics; war requirements further expanded the use of this better insulation material.

Here's the "line" of Fiberglas Tapes, in a wide range of weaves, thicknesses and finishes. They meet both electrical and mechanical requirements — and provide maximum ease and economy of application.

Untreated Fiberglas Tapes...

... are available in *thicknesses* from .003" to .015", from 3/8" to 1½" in width and in *medium weave* (machine taping) and *tight weave* (hand application). Their high strength-to-thickness ratio and lack of stretch have won them preference for such uses as coil wrappers, protective coverings, conductor insulation, mechanical reinforcements, etc. They are used in many kinds of electrical apparatus, from small relay coils to huge turbogenerators.

Varnished Fiberglas Tapes...

... are made by many processors who impregnate various Fiberglas cloths with several types of varnishes. They are cut to any desired tape width. Varnished Fiberglas Tapes are available in thicknesses from .003" to .030", with either black or yellow varnish.

Because of its higher dielectric strength, and because it retains good mechanical and electrical characteristics under prolonged exposure to adverse operating conditions, thinner thicknesses of Varnished Fiberglas are used.

Performance and Application Data...

... facts about Fiberglas-Mica combinations, Fiberglas Insulated Wire and Cable, Fiberglas Pressure-Sensitive Tape and Fiberglas Laminates. *Write for your copy today* and ask for the name of the Fiberglas Insulation Materials Supplier located nearest to you. *Owens-Corning Fiberglas Corp., 1858 Nicholas Bldg., Toledo 1, O.*

In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

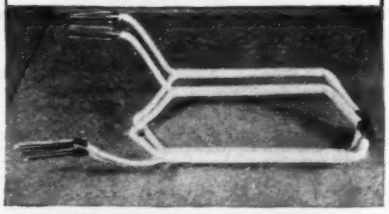
Each distributor of Fiberglas-base Insulation Materials has his own source of supply, since Owens-Corning Fiberglas Corporation does not process these materials.

There is a FIBERGLAS Insulation Material for every need

Untreated Fiberglas Tape from .003" to .015" in thickness; from 3/8" to 1½" in width.

Varnished Fiberglas Tape, from .003" to .030" in thickness, cut to any desired width. Various ratios of varnish film to Fiberglas dependent upon processors.

Taping machine application of Fiberglas Tape to a coil.



Coils wound with Fiberglas Tape.

There is a Fiberglas Electrical Insulation Material to meet virtually every insulation need. Write for catalog EL 44-7A today.

FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

ARMY E NAVY

ELECTRICAL INSULATION MATERIALS

LOAD SERVICING

Commercial
Industrial

Residential
Rural

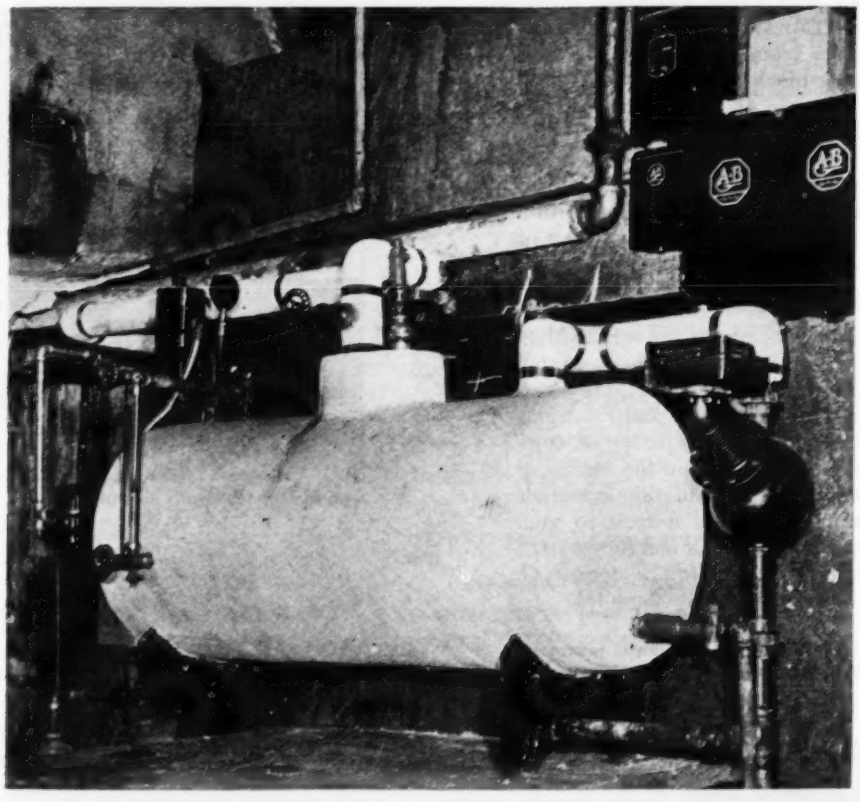
Electric Steam Boiler for Pressing Machines

Solution to a steam supply problem for pressing machines in a Portland (Ore.) department store was found in the electric steam boiler installation illustrated. The store had abandoned its steam and electric generating plant, purchasing both types of service from Northwestern Electric Co. Since the utility's central station steam is delivered at low pressure, it became necessary for the store to install a high-pressure steam generator for two pressing machines.

The installation consists of a 28-gal. boiler with nominal boiler horsepower rating of 1.6. Two 8-kw. Chromolox immersion heaters are steam pressure controlled as a unit. Water injection is by means of a McDonald-Miller Co. high and low water cutoff control unit.

The electric boiler saved an undetermined investment in flue from basement to roof of a five-story building that would have been necessary had gas fired equipment been used. Operation has proved highly satisfactory to Olds Wortman & King, the customer. No data are available on kilowatt-hour and operating cost since the boiler is not separately metered.

Particular feature of the boiler that has made it so successful as compared with other local attempts at providing steam for pressing machines, is the dry steam dome on top of the boiler. This may be seen in the accompanying photograph. Manufacturer of the boiler is the Gabriel Fabrication & Erection Co., Portland, Ore. The job was engineered for the power company by D. O. Bergey, manager, commercial and industrial sales.



FEATURE OF THIS SMALL ELECTRIC STEAM BOILER for supplying pressing machines is the dry steam dome at the top. Two 8-kw. heaters are steam pressure controlled. Water injector is the black device at extreme right center

•

Offers Co-Op Plan to Dealers on Trial

F. I. FAIRMAN
Director Customer's Service
Kentucky Utilities Co.
Lexington, Ky.

Merchandising of electrical appliances, including farm, commercial and industrial equipment, incandescent and fluorescent lamps in the 433 communities served by Kentucky Utilities Co., Lexington, is to be left to local dealers for a trial period extending into the post-war years. The company is experimenting with this new merchandising policy, for two reasons:

1. To encourage local business enterprise by allowing a greater amount of business to accrue to the dealers.
2. To determine the effectiveness of a dealer-company cooperative plan of load building.

Under the plan the company will not merchandise but it will, in any case where dealer facilities are inadequate to give customers satisfactory service, establish a retail or commercial sales department as needed.

A—The Company's Part

Assistance that the company will offer to dealers under the new dealer cooperative plan covers six major points as follows:

1. Company display floors and show windows will be available to dealers for showing equipment. Available space will determine the number and frequency of each dealer's displays.
2. Company auditoriums where available, will be accessible for dealer cooking schools and demonstrations of other equipment. All equipment for such demonstrations will be supplied by the dealer even though a company home economist conducts the meeting.
3. Company sales supervisory personnel will assist dealers with sales training programs, store arrangement, service problems and demonstrations.
4. Company will maintain an active sales promotion organization. This organization will consist of:

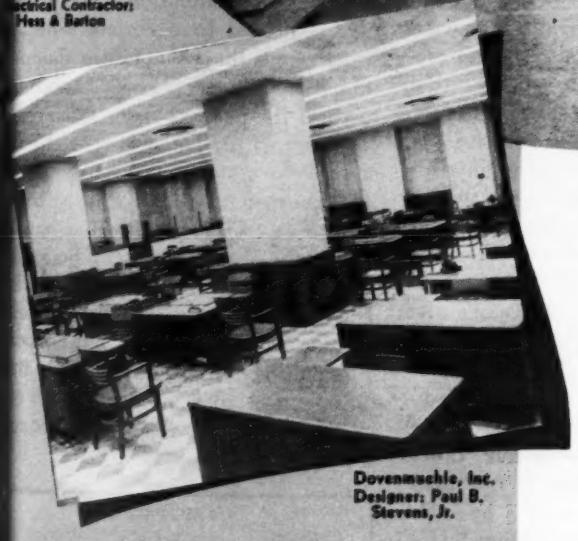
(a) Home service advisers to help

PITTSBURGH REFLECTOR COMPANY *Presents*

EXAMPLES OF *Permaflector Lighting*

& Company
itect: E. Paul Behles
Associates
rical Contractor:
rgenstern Electric
., Inc.

l Planetarium
rchitect: Ingham & Boyd
ctrical Contractor:
Hess & Barton



Dovenmuehle, Inc.
Designer: Paul B.
Stevens, Jr.

Full data on "light-engineered" PERMAFLECTOR Equipment is yours for the asking. Write for catalog.

There is a Permaflector Unit for Every Lighting Application

PERMAFLECTOR Lighting Equipment is adaptable to all industrial, commercial and institutional lighting applications.

Whether you need fluorescent or incandescent illumination or a combination of both—you will find in PERMAFLECTORS the complete answer to all your lighting requirements.

Illustrated here are three typical PERMAFLECTOR installations. They are indicative of the thousands of outstanding installations throughout the United States and the world in which PERMAFLECTORS have been used to achieve original lighting effects and efficient illumination.

The next time you want the distinctive in lighting—specify PERMAFLECTORS. They are simple to install, easy to maintain and provide maximum lighting efficiency as well as flexibility of design.

"Pittsburgh" Permaflector

Pittsburgh Reflector Company

OLIVER BUILDING • PITTSBURGH 22, PA.

Manufacturers of Permaflector Lighting Equipment Distributed by Better Electrical Wholesalers Everywhere

Permaflector Sales Engineers in All Principal Cities

PERMAFLECTORS • SPOTLIGHTS • FLOODLIGHTS • WIRING DEVICES • FLUORESCENT EQUIPMENT

develop prospects, instruct customers in proper use and care of appliances, make minor adjustments, repairs, etc.

(b) Home economists to help demonstrate dealer equipment and help housewives to use their major appliances properly.

(c) Commercial service engineers to help develop the sale of commercial equipment and act as advisers to commercial customers.

(d) Farm service advisers to help develop productive and profitable services; primarily those uses of electricity outside the farm home.

(e) Industrial service engineers to consult with industrial customers and develop industrial services for existing and new industrial developments.

5. Company advertising (newspapers, radio, bill stuffers, brochures, show window) will be used to help promote:

(a) All electric kitchens; (b) Better Light-Better Sight; (c) adequate wiring; (d) sale and use of electric appliances; (e) electric service on the farm and (f) commercial heavy duty equipment, modernized store fronts, health and comfort equipment, etc.

6. Dealer campaign manuals and bulletins will be prepared for special campaigns, to coordinate sales activities of jobbers, dealers and company. Monthly bulletins will be mailed showing total unit and gross sales by districts and other helpful sales information and statistical data.

B—The Dealer's Part

Dealers participating in the plan will be expected to assist in the following manner:

1. Display and stock merchandise that includes promotional items as well as those having public acceptance. Farm electric equipment and commercial counter equipment of standard sizes and designs should be stocked where these markets exist.

2. Employ aggressive sales personnel to help develop prospects and follow up prospects reported by the company. Though the utility will maintain a large, active sales promotional organization this is only to augment dealer sales personnel in order to do the accelerated merchandising and load building job that must be done.

3. Dependable repair service facilities in each community are necessary for a complete merchandising and load building program. This can be accomplished by each dealer maintaining his own service shop or by all dealers pooling their work in a community service center.

4. Cooperative advertising, with each dealer and the company simultaneously promoting a given service; sales results are much greater for the same expense than with intermittent promotion.

5. Sales information as to unit and gross sales must be willingly and accurately provided by each dealer in order to keep a record of progress and results. Each dealer's report will be kept confidential and used only to give combined overall results.

6. Ethical and sound business relations and policies can be maintained by cooperating with other dealers, jobbers, manufacturers and the company. Tying in with industry programs, educational sales training meeting, sponsoring of electrical shows and appliance exhibits, etc., all help build profitable sales volume and better community trade relations.

•

Uncommon Uses for H. F. Heating—VI*

E. D. TILLSON
Testing Engineer,
Commonwealth Edison Co., Chicago, Ill.

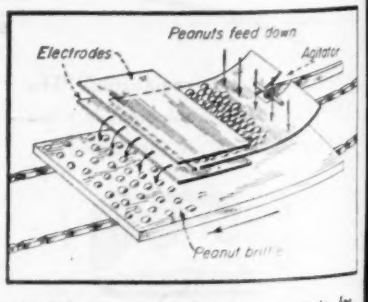
The two applications of high frequency induction and dielectric heating illustrated herewith are part of a series of 14 applications selected from the files of the Commonwealth Edison Co. They represent only a handful of the successful experiments in the application of high frequency heating which have been conducted by this company as a service to its industrial customers in the Chicago area. These applications are presented in an attempt to illustrate the range and scope of high frequency heating as an industrial production tool.

Case 11. After collapsible tubes are filled with tooth paste, ointment or what not, they are sealed by folding and crimping at the bottom. Unfortunately a certain percentage of these folds later open and the ointment comes out the wrong end. This has been stopped by coating the inner metal surface with a plastic bonding film, folding and heating the bond inductively to 250 deg. using a single-turn coil and loose coupling. Time required is one second. Production was 17,000 tubes per day. Attempts have been made in the past to heat the crimping dies by gas or other means but there is a tendency for the lead to stick to the die so that the fold opens up as the dies are retracted. Induction heat, which requires no physical contact, has avoided this pitfall.

CASE 11—Induction heating heats crimped end of collapsible tube

Case 12. Peanuts processed into peanut brittle in Chicago come largely from the southern states and at certain times of year are received in a badly infested condition. High frequency dielectric heating offered a means of heating the peanuts quickly and thoroughly to a temperature lethal to all insect life and without interior or exterior burning.

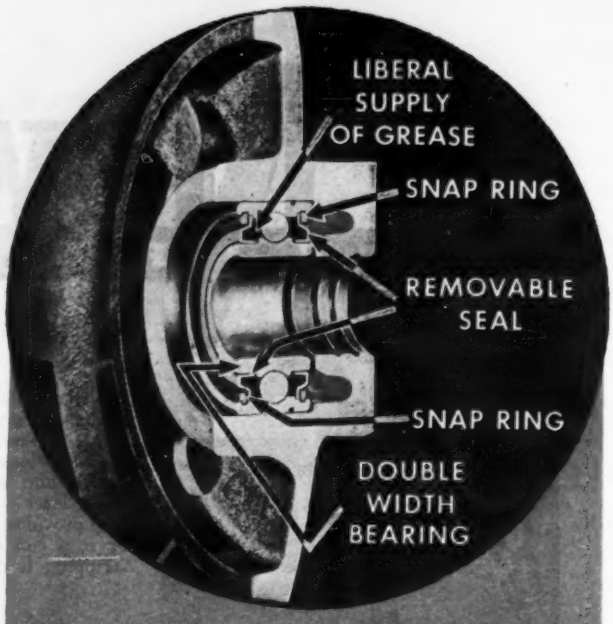
But now there was another problem that required attention. The candy mix is heated to a certain point at which time the peanuts are dumped into it. Further cooking is supposed to roast the peanuts at the same time. However, if the batch is cooked long enough to assure proper roasting of the peanuts, the candy may be overcooked or scorched. The plan now is to pre-cook the peanuts by high frequency before dumping into the mix. The results of experiments so far are encouraging. It may be that the peanuts will have to be heated in oil, but inasmuch as they are coated with oil in any case, this does not introduce a new element.



CASE 12 — Preheating peanuts for candy by high frequency dielectric heat

* Based on paper presented by the author before "High Frequency Heating Conference" sponsored by Great Lakes Power Club and Chicago Lighting Institute.

ANOTHER WESTINGHOUSE MOTOR "FIRST" WHICH REDUCES INDUCTION MOTOR MAINTENANCE TO A NEW LOW... NOW STANDARD ON TYPE CSP MOTORS, 3 HP AND BELOW



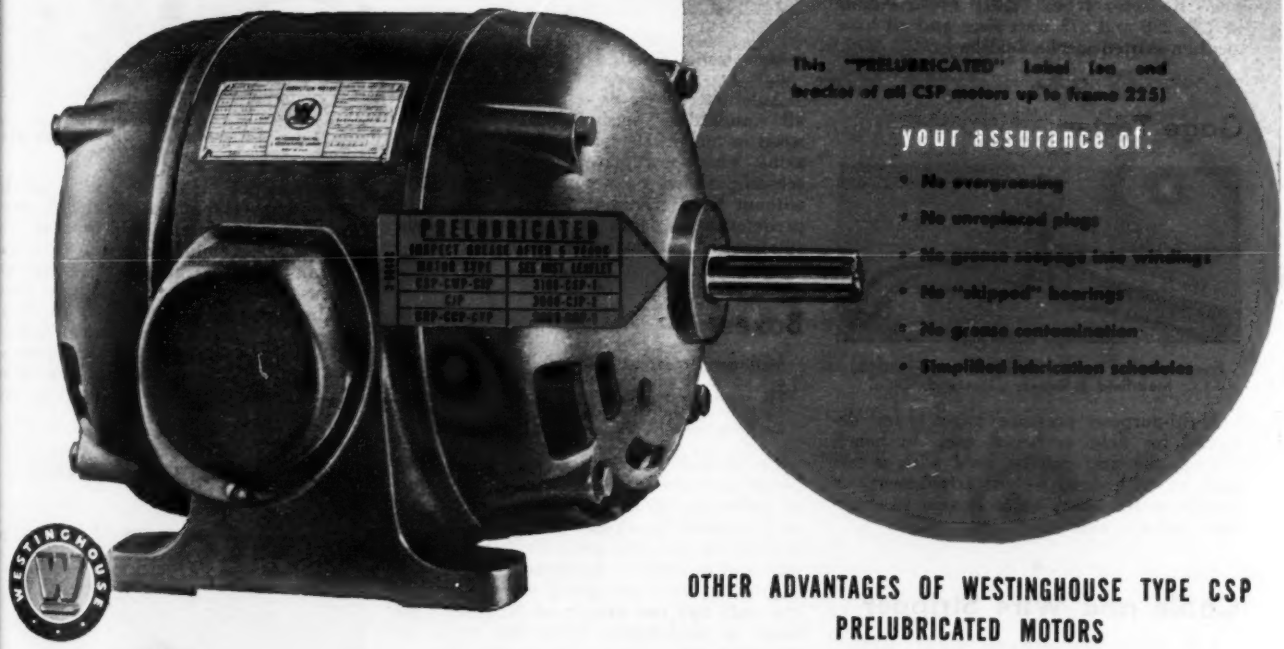
Install now... lubricate once between 1945 and 1955! Think of what this means in terms of man-hours saved—because you can forget lubrication of Type CSP Motors for *5 years* or more after they are installed.

Prelubricated ball bearings are not new in Westinghouse Motors. They have been proved in thousands of textile motor applications—which have run continuously for 7 years and been found in perfect condition after that time.

The CSP motor is another example of the extensive and continuous Westinghouse developments which have contributed to induction motor design. For full information, call your Westinghouse office—ask for DB-3100-CSP, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-21330

only ONE lubrication...

BETWEEN 1945 AND 1955!



This "PRELUBRICATED" Label (on end bracket of all CSP motors up to frame 225)

your assurance of:

- No overgreasing
- No unreplaced plugs
- No grease seepage into windings
- No "skipped" bearings
- No grease contamination
- Simplified lubrication schedules

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

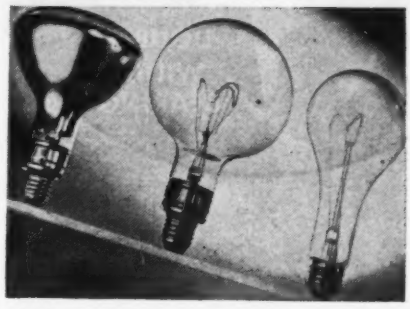
TYPE CSP MOTORS

OTHER ADVANTAGES OF WESTINGHOUSE TYPE CSP PRELUBRICATED MOTORS

- Longer grease life
- TUFFERNELL Insulation
- *Die-cast Rotor* with oversize fan
- *Dynamically Balanced Rotor*
- *Liberal Through-Ventilation*—air enters front and leaves at drive end of motor

NEW EQUIPMENT

Infrared Lamps

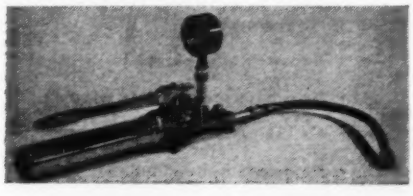


Infrared clear types and reflector type lamps: 115 volts; 125 to 500 watts. **Sylvania Electric Products Inc.**, Salem, Mass.

Seven infrared lamps made in four clear drying and in three reflector drying types. Clear drying types are said to provide a constant heat center length, which permits a change in oven temperature by substituting lamps of suitable wattage. Bulb PS 25 is rated at 125 watts and has a medium base. All others have medium-skirted mechanical bases. Bulb G30 is available in 250 and 375 wattages and G40 in 500 watt size. Reflector types (R40) are available in 125, 250 and 375 watt sizes and all have medium-skirted mechanical bases.

•

Gage Tester



Pressure gage tester: Pressure up to 10,000 p.s.i.; **Mansfield & Green**, Cleveland, Ohio.

Multi-purpose pressure gage tester designed for field or bench use. In bench testing, the unit can be used with a test gage or with dead weight attachment. A double sealed check valve is said to eliminate leakage and loss of pressure.

•

Cable and Wire Stripper

Wire stripper for removing rubber, asbestos, synthetic, plastic, glass, cambric and other insulation. **Ideal Commutator Dresser Co.**, 1021 Park Ave., Sycamore, Ill.

Stripper for removing insulation from any lengths of wire and accommodates all sizes up to $\frac{3}{8}$ in. in diameter. To use the stripper, the wire is laid between two jaws and cutting blades. A handle is pulled which causes the jaws to grasp the wire and draw it through the oscillating blades. Among features reported are: jaws automatically center and grip wire without manual adjustment, no scraping or nicking of conductor, instant release of wire at end of stripping stroke and automatic opening of blades when lever is pushed forward. Adjustable stop provides for control of stripping length, or stop can be removed when extra long stripping is desired.

•

Electric Screw Driver

"Screwmatic" screw driver: weight 6 lb. **Reed-Prentice Corp.**, Worcester 4, Mass.

Automatic screw driver designed to drive all standard or special head screws into wood or metal. Detachable self-filling magazine, which is replaceable in a matter of seconds, allows near continuous operation without hand feeding. Screw is driven to predetermined depth at which point blade rotation is automatically stopped.

•

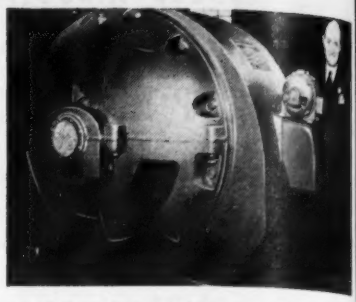
Boxes

Multi-gang receptacle and device boxes: single up to 12-gang; sizes from 4⅝ in. long by 2⅞ in. wide by 2¼ in. deep to 45⅛ in. long by 22¾ in. wide by 2¼ in. deep. **Wiremold Co.**, Hartford 10, Conn.

Cover and base of one- to three-gang boxes inclusive are provided with groups of twistouts on each side and ends, and with conduit knockouts in the base. The four- to twelve-gang boxes have three twistouts and no conduit knockout. The five- to eight-gang have one group of twistouts on the ends and two groups on the sides; the nine- to twelve-gang have one group on the ends and three groups on the sides.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Motor

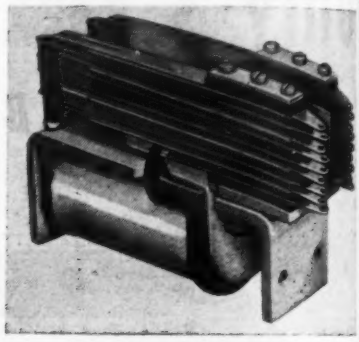


Tri-clad motor: 2,000 hp.; 6360-frame series; 2300-volt, 3-phase, 60 cycles; 1,800 r.p.m. **General Electric Co.**, Schenectady 5, N. Y.

A 2,000 hp. squirrel-cage induction-type motor of the Tri-clad line is designed for utility and industrial applications. It is reported as containing all the basic protective features of the line and includes protection against physical damage, electrical breakdown, and operating wear and tear. End shields are stated to be of split cast iron construction to facilitate maintenance and are said to provide resistance to rust, corrosion and accidental blows.

•

Relay

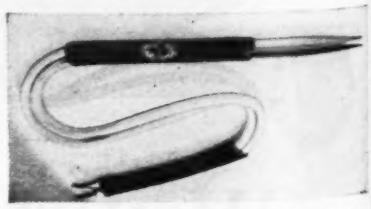


Type 20,000 multi-contact relay: voltages up to 28 d.c. **R-B-M Mfg. Co., Division Essex Wire Corp.**, Logansport, Ind.

Relay is designed for use in signal, electronic and communication circuits where low operating currents are essential. Contact spring assemblies are said to be available in one, two and three stacks—with various combinations, according to circuit requirements, up to 16 springs. Coils are reported as treated to withstand humidity and to prevent fungus growth. Relays are said to be available with quick acting, slow dropout and slow pickup armatures.

•

Spot Welding Tweezers



Spot welding tweezers: standard leads 18 in. used with installed spot welding equipment. **New Jersey Jewelers' Supply**, 280 Plane St., Newark 2, N. J.

Accessory to installed spot welding equipment consists of a pair of insulated, forged copper tweezers with plastic covered, flex-

Thirty Years Ago

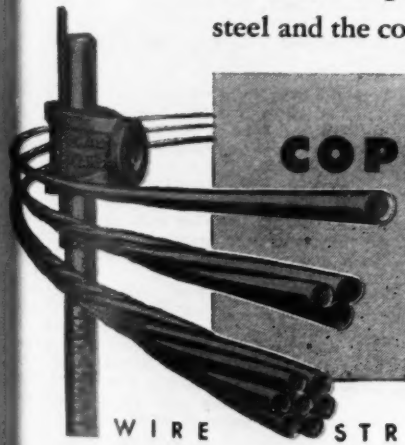
A DREAM CAME TRUE---

Copperweld presented the first successful copper covered steel wire

Combining The Strength of Steel with the Conductivity and Permanence of Copper

Since this dream became a reality, thirty years have passed—years of development and growth in the Power, Transportation and Communication Fields—years of steadily increasing demands for Copperweld Products made from copper molten-welded to a core of high-strength alloy steel.

Today, Copperweld power conductors, communication wires, ground rods, guy and messenger strands, overhead ground wires and signal bonds are contributing to the speed and power of our war activities. In the period ahead the intensified developments of research and the increased output of our expanded plant facilities will be at your service —to insure dependable performance wherever you need the strength of steel and the conductivity and rust-resistance of copper.



COPPERWELD STEEL COMPANY

ARMY E NAVY

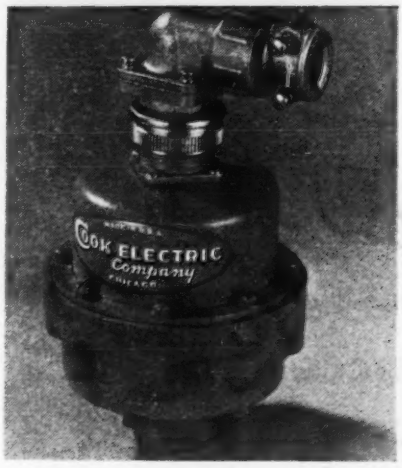
GLASSPORT, PA.

WIRE • STRAND • GROUND RODS • SIGNAL BONDS

ible, copper leads terminating in a pair of lugs which connect in place of regular welding electrodes. Copper jaws are held like an ordinary pair of tweezers, brought in contact with parts to be welded, current is applied and weld is made.

•

"Hi-Pressure" Switch



Hi-Pressure switch: withstand 3,000 lb. surge load; 10 amp. at 125 v a.c.; S.P.D.T.; weight 2 lb. **Pressure Switch Division, Cook Electric Co.,** 270 Southport Ave., Chicago 14, Ill.

Switch is said to be capable of withstanding 3,000 lb. surge load and has an adjustment range of from 100 to 2,000 lb. with a 20 lb. differential at 100 lb. Pressure connection can be made with either ¼-in. or ⅜-in. standard pipe thread. It is said to be adaptable to hydraulic systems for controlling pressures, cutting out circuits at predetermined pressures, and for controlling surge loads.

•

Dielectric Heater

Type K-5 "Heatmaster": output 5. kw.; input 8 kva.; 220 volt, 60 cycle, 3-phase; frequencies—30, 15 and 5 megacycles; 24-in. wide, 28-in. deep, 59-in. high; wt. 1,000 lb. **Radio Receptor Co., Inc., Thermatron Division,** 251 W. 19th St., New York 11, N. Y.

Unit is stated to be applicable to plastics, dehydration, sterilization and other purposes. It is said to have a built-in electrode cage, radial-fin air-cooled tubes, safety interlocks, overload relays and breakers, calibrated pushbuttons. Unit is available with foot control and continuous belt accessories.

Milliohmmeter

No. 673-F milliohmmeter: six scales ranging from 0 to 0.5, 1.0, 5, 10, 50 and 100 ohms full scale **Schallcross Mfg. Co.,** Collingdale, Pa.

Medium range meter has linear scales which is said to eliminate crowding at the upper end of the scale. Instrument is said to utilize separate connections for current and potential leads so as to minimize the effect of lead and contact resistance at low values. It uses a single No. 6 dry cell battery housed in a compartment built into the instrument.

•

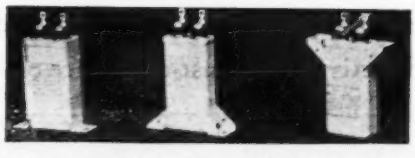
Tube Tester

Model "450" tube tester: operates on 90 to 125 v., 60 cycles a.c.; tests all tubes up to 117 v. including 4, 5, 6, 7, 7L, octals, loctals, bantam junior, peanut, television, magic eye, hearing aid, thyratrons, single ended, floating filament, mercury vapor rectifiers, etc., and pilot lights. **Superior Instrument Co.,** 227 Fulton St., New York 7, N. Y.

Unit is housed in a portable leatherette covered cabinet and tests by the emission method. Tube condition is indicated directly on the meter scale. It is said to test for shorts and leakages up to three megohms, shorts and leakages of any one element against all elements in the tubes, both plates in rectifiers, and individual sections such as diodes, triodes, pentodes, etc., in multipurpose tubes.

•

Capacitors



Fixed paper-dielectric capacitors with glass terminal seals: case styles CP-60, 62, and 64; capacitance values from 0.05 to 0.50 micro-farads, for voltages of 600, 1000, and 1500. **General Electric Co.,** Schenectady 5, N. Y.

Capacitors are said to comply with requirements of the proposed joint AN Specifications JAN-C-25. Glass terminal seals are said to provide a high degree of resistance to humidity, fungus growths and termites. They are reported as not relying on matched coefficient of expansion of glass and metal to resist thermal shock, nor on soft solder for mechanical strength.

TECHNICAL LITERATURE

Coal Handling—Folder No. 2068 entitled Sidekar-Karrier for Bulk Materials is available from Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill. It describes dust-tight coal handling equipment and contains several drawings showing elevation and engineering data of units. Also contains illustrations depicting typical installations.

Fin Type Radiation—D. J. Murray Mfg. Co., Wausau, Wis., has released a folder describing cast-iron "fin" type radiation. It contains charts and illustrations and installation data of the unit heaters and an explanation of "carry-over" of heat due to material of construction.

Canadian Standards—Supplement No. 2 of Interim and Emergency Revisions to Canadian Electrical Code (C 22.1-1939-C.E. Code—Part 1—Supplement No. 2) is available from the Canadian Standards Association, Ottawa, at 15 cents per copy. It contains the twenty-one revisions which have been formally approved by the appropriate committees and are published as tentative revisions.

Alloys—Two lists of references have been compiled on the uses of Carium as an alloying agent in conjunction with aluminum and magnesium. There annotated bibliographies have been selected from English, French and German material of the past twenty years. Important articles are briefly summarized. Sources are indicated and patents are listed. Copies are available without charge from Carium Metals Corp., 522 Fifth Ave., New York 18, N. Y.

Vibration—A simplified means of selecting rubber insulated engine mountings that stop engine vibration is contained in bulletin 'BU-23, which can be obtained from Bushings, Inc., 3442 W. Eleven Mile Road, Berkley, Mich. Bulletin contains a simplified formula for calculating the proper mounting for any given load, as well as dimension drawings of four types mountings capable of handling loads of from 20 to 600 pounds.

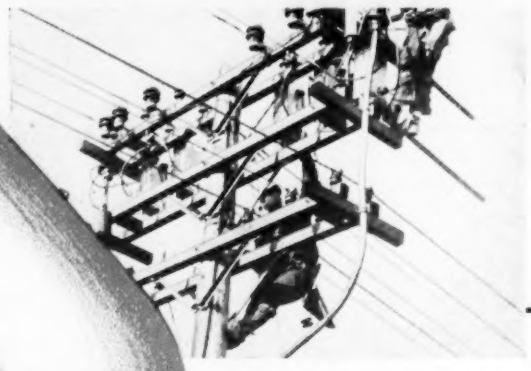
Mercury Arc Converters—Bulletin No. B 6373 on the subject of mercury arc converters may be obtained from Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. It contains graphs and "exploded" views of the converter and compares it to other types of equipment used for induction heating. Differences between the "old" and the "new" method of heating and melting metals are summarized in quick-reading illustrated form.

Bus Structures—Publication No. 456 entitled "Reinforced Bus Structures" may be obtained from Delta-Star Electric Co., 2400 Block, Fulton St., Chicago 12, Ill. It pictures and describes straight-of-way, corners and vertical high voltage buses and the method of reinforcing against stresses caused by short circuiting currents.

Veterans' Jobs—Copies of the leaflet entitled "Jobs for the War Disabled" may be obtained free of charge from the American Veterans Association, Inc., 271 Madison Ave., New York 16, N. Y. Contains answers to such questions as: whose responsibility, complex jobs, asset or liability, can a disabled man do real work, higher insurance premiums, and concludes with one section titled "What to do and how."

Radio Tubes—"Pin-up Chart" to assist radio and electronic design engineers in the selection of tubes for specific applications is available from Sylvania Electric Products, Inc., 500 Fifth Ave., New York 18, N. Y. Tubes are listed for convenience and ease of selection.

WIDER POWER DELIVERY



BUILDING TOMORROW'S LOAD TOGETHER

DURING THE "BATTLE OF PRODUCTION" the electric power companies and the electrical manufacturers, distributors, and contractors forged their various services into a single, strong chain — a chain of cooperative effort to speed war production *electrically*.

THIS SAME TEAMWORK, applied to the problems of reconversion, will speed the coming of tomorrow's electrical world. Our common interest is two-fold: (1) to increase the *availability* of electric energy; (2) to increase the *efficient usage* of electric energy.

GRAYBAR IS PREPARED to do its share of both phases of the job: (1) by providing the equipment and supplies for extension of power distribution systems, for intensive maintenance of power lines, and for electrical reconversion of industrial plants; (2) by furnishing a wide variety of properly designed current-carrying supplies and current-using appliances and equipment for home, office, farm, and factory. Graybar Specialists know how to meet your electrical requirements exactly.

THE FOLLOWING SECTION shows products of 40 of our suppliers — each a leader in its field. Our network of 86 warehouses helps make these products readily available anywhere in the U. S. A.

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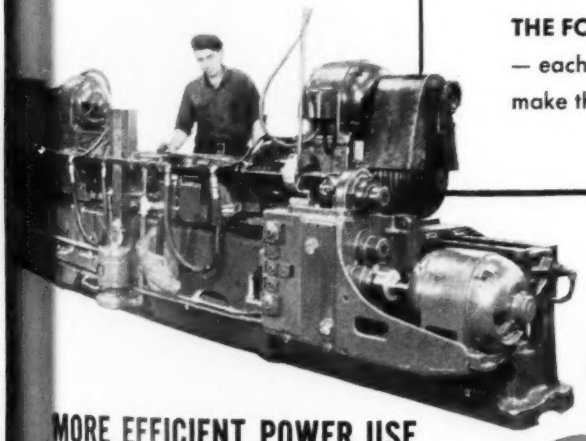


MORE EFFICIENT POWER USE

Via Graybar ...the Double-Duty Source of Supply

IN OVER 80 PRINCIPAL CITIES

T&B

WHAT ARE YOUR WIRING PROBLEMS?

At your service are our 47 years of specialized experience in the design and manufacture of electrical fittings engineered for all kinds and sizes of wires and cables, and their raceways. We have specialists who will take your problems, study them and come up with practical recommendations.

T&B illustrated Catalog #44, sent free on request, is full of technical information, engineering data and specifications about these and other T&B standard Code-Approved lines. They are particularly useful for industrial reconversion and for all electrical repair and maintenance work.

Through War and Peace, the T&B Plan of 100% Wholesaler Distribution of all T&B Products has proved its sound basic economy.

THE THOMAS & BETTS CO.
INCORPORATED
manufacturers of electrical fittings since 1898
ELIZABETH 1, NEW JERSEY
In Canada: Thomas & Betts Ltd., Montreal

BUILDING TOMORROW'S LOAD TOGETHER

"Speaking of Conduit — just remember ORANGEBURG and you can forget it!"

ORANGEBURG Conduit is so well known and widely used because once installed you *can* forget most conduit troubles. ORANGEBURG gives sound assurance of longer cable life and fewer cable failures because:

ORANGEBURG'S *LOW COEFFICIENT OF FRICTION* keeps cable pulling tension to a minimum.

ORANGEBURG'S *SMOOTH INNER SURFACE* does not score or damage the cable sheath as it is being pulled into the duct, or as it creeps with load changes.

ORANGEBURG'S *TIGHT TAPER SLEEVE JOINTS* and impermeable walls prevent the infiltration of ground water.

ORANGEBURG'S *NON-CORRODIBLE MATERIAL* is not disintegrated or destroyed by the action of ground waters or chemical wastes. Orangeburg's special composition is not corrosive to the cable sheath. Records of over 50 years' service show that once installed Orangeburg Conduit is good for many decades.

ORANGEBURG'S *ECONOMY OF INSTALLATION* results from low first cost, low transportation and installation costs.

ORANGEBURG'S *EASE OF INSTALLATION* is made possible by light weight, easy handling, easy sawing, easy laying. Joints can be quickly made on the job. The taper sleeve coupling assembles speedily to produce a watertight joint without the use of compounds. No special tools necessary. Changes of direction easily made.

ORANGEBURG *SERVICE FITTINGS* such as bends of various radius and degree, angle couplings, expansion joints, union connectors, bell ends and other standard fittings are available to meet any unexpected conditions, avoid costly delays and make every job satisfactory.

ORANGEBURG *PIONEERING AND PROGRESS* has been continuous since 1893, in the development of superior fibre conduit design and workmanship, with lower cost to the user.

ORANGEBURG STANDARD
for installation with
concrete encasement

●

ORANGEBURG NOCRETE
for installation without
concrete encasement

ORANGEBURG FIBRE CONDUIT

THE FIBRE CONDUIT CO. ORANGEBURG N.Y. EST 1893

ORANGEBURG

WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY

"We Put An End To Electrical Shutdowns On Our Compressor Circuits By Standardizing On BUSS Super-Lag Fuses"

—S. S. "Jerry" HOGATT, *Chief Electrician*
JACKSON BREWING CO. • NEW ORLEANS

Bernard L. Kiernan, Chief Engineer, checking operation charts in his office.

Mr. Bernard L. Kiernan, Chief Engineer of Jackson, the largest brewery in the South, amplifies Mr. Hogatt's statement with these added facts—"Our compressors and pumps formerly gave us constant trouble. Frequent fuse blowing, due to the heavy load when the compressors started, caused many shutdowns. We couldn't afford the costly experience of having our equipment out of service when we needed all the production we could get. We eliminated that problem, though, when we standardized on BUSS Super-Lag fuses. They have helped us save a lot of time, annoyance, and expense—and helped keep production up, too."

S. S. "Jerry" Hogatt, Chief Electrician, on inspection tour in his spotlessly clean plant.

BUSS *Super-Lag*

SOLD THROUGH WHOLESALE

BUILDING TOMORROW'S LOAD TOGETHER

Why BUSS Fuses greatly reduce or entirely prevent needless blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus excessive heating, which causes fuses to blow needlessly, is prevented.

The fuse link used is the famous "BUSS Super-Lag". It has lag-plates attached to it. These give it a time-lag so long that it will reduce to an extent not possible with any other renewable fuse, the number of shutdowns caused by needless fuse blows.

Prevent future trouble in your plant—by doing this today

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then, as fuses are replaced or new installations made, your plant will automatically get the benefit of the care-free, trouble-proof protection that BUSS Super-Lag fuses afford.

BUSSMANN MANUFACTURING CO.
St. Louis 7, Mo.
Division McGraw Electric Company

Why BUSS Fuses Don't Blow Needlessly

10 FEATURES in the design of the FUSE-CASE help make it possible

and ***The SUPER-LAG*** development in the FUSE-LINK completes the job.

FUSES

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY

. . . WITH LIGHTS

BUILDING TOMORROW'S LOAD TOGETHER

ABLAZE AGAIN

General Cable Corporation, as a manufacturer, and Graybar Electric Company, as an important distributor, prepare for the tasks of peace.

Throughout the war, General Cable Corporation and one of its important distributors — the Graybar Electric Company — have kept *first* in mind the vast requirements of America's armed forces and essential industries.

Now, as war's end approaches, both General Cable and Graybar look forward to a continuing *partnership* in supplying the needs that will arise in America's peacetime future.

For General Cable, it is simply a matter of turning to production for peace all the skills and manufacturing economies born of wartime experience. And of expanding its wire and cable research and development as needs of the Electrical Utilities and Industry require.

For Graybar, it is simply a matter of continuing its distinguished service as one of America's major sources of supply *for all that is electrical.*

GENERAL CABLE CORPORATION

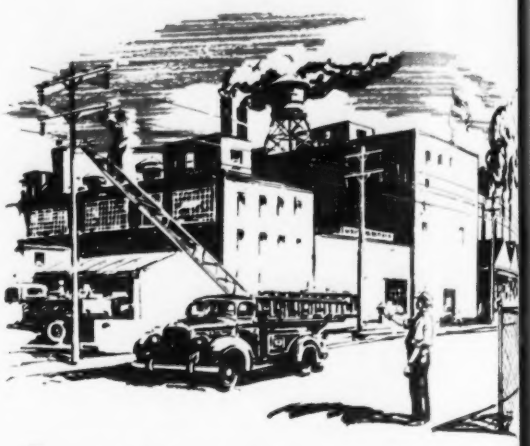
Manufacturers of Bare and Insulated Wires and Cables for Every Electrical Purpose

Via Graybar — THE DOUBLE-DUTY SOURCE of SUPPLY

FUTURE PLANNING THAT STARTED 83 YEARS AG

POWER FOR WAR

Helping to keep aloft the nation's power lines, vital to the Battle of Production, is but one of American Crossarm's present-day jobs. Beyond that, it has sent to the Fighting Fronts, all over the globe, almost 2 million crossarms, almost 20 million pins and brackets and numerous other staples and specialties. And it is prepared to do still more.



PREPAREDNESS FOR PEAC

Long before the Boys come marching hom American Crossarm will be "reconverted" b we still are producing the things we have be making for more than 80 years. With equipme in good order, an organization that is well rounde and on its toes and with methods and knowledg further improved, the swing to peacetime pr duction will involve little more than the writi of new shipping tags.

PLANNING FOR THE FUTURE

America's postwar planning is simple... and sound ... involving but two steps: (1) To make the best product that can be made, and (2) to distribute it in the way that best serves the consumer's interests.

We confidently believe that in the Future, as in the long Past, the combination of American's manufacturing skill and Graybar's unexcelled national distributing facilities will spell Greater Satisfaction to the User, wherever he may be.

GENERAL OFFICES
22 W. Monroe Street,
Chicago, Illinois

SALES OFFICES
New York, N. Y.
Kansas City, Mo.
Chehalis, Washington
Texarkana, Texas

AMERICAN · CROSSARM
AND CONDUIT COMPANY

RAINIER
WOOD PRODUCTS
TRADE MARK
FOR
OVERHEAD AND UNDERGROUND CONSTRUCTION

FACTORIES
Chehalis, Washington
Chicago, Illinois
Kansas City, Mo.
North Bergen, N. J.
Texarkana, Texas

BUILDING TOMORROW'S LOAD TOGETHER

EXPERT JUDGMENT PREFERS

American Rope

POWER AND COMMUNICATIONS...

It's a never-ending job vital to our war effort to maintain and expand the power and communication systems of the nation. Because they must have the very maximum of reliability, utilities companies make exhaustive tests of materials before they buy. For the innumerable uses to which they put rope, "American" Rope meets their high standards with dependability to spare.

Care Saves Rope . . . a Vital War Material

AMERICAN MANUFACTURING COMPANY, BROOKLYN 22, N. Y. • ROPE • TWINE • PACKING • OAKUM

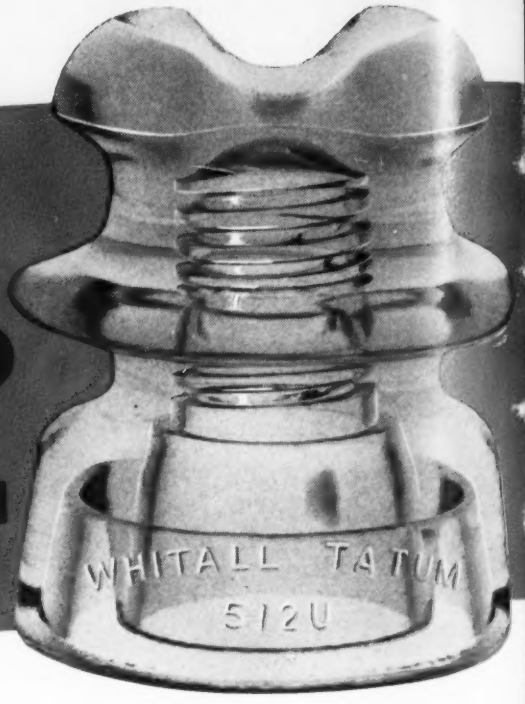
Branch Factory: ST. LOUIS CORDAGE MILLS, ST. LOUIS 4, MO.

Sales Offices: BALTIMORE • BOSTON • CHICAGO • HOUSTON • NEW ORLEANS • PHILADELPHIA

Via Graybar — THE DOUBLE-DUTY SOURCE of SUPPLY

FULLY RECOGNIZED

FOR POWER DISTRIBUTION



Armstrong's Universal-Type 512U Insulator meets all A.S.A. and E.E.I. specifications

GLASS insulators are now recognized as standard equipment for power distribution by the American Standards Association and the Edison Electric Institute. Armstrong's No. 512U meets the standards and specifications prepared by both these organizations for low and medium voltage pin-type line insulators.

You can use this universal-type Armstrong's "Whitall Tatum" Insulator as a side groove, a top groove, or as a double groove—the double groove being adaptable for breaking a series street-lighting circuit at a lamp cut-in. The top groove and upper side groove of No. 512U accommodate conductors up to the diameter of 4/0 tree wire. The lower side groove takes conductors up to the equivalent size of No. 4 tree wire. The interchangeability of No. 512U enables you to reduce inventory, providing substantial savings in both money and storage space.

Armstrong's No. 512U is made of uniform glass which is free from flaws. Pin cavities are accurately gauged to insure proper pin fit. And the resistance of No. 512U to thermal shock, proved in test and in the field, assures you that this insulator will perform satisfactorily in torrid heat and in subzero cold.

Full line of communication and signal insulators available

You can obtain a complete line of communication and signal insulators from Armstrong. Many designs are now standard with America's leading railroads, telegraph systems, and telephone companies. Like Armstrong's No. 512U, these durable insulators always fit snugly on pins . . . will withstand all weather conditions.

ARMSTRONG'S
"WHITALL TATUM" GLASS INSULATORS

Armstrong's Glass Insulators are available through your local Graybar representative.

Free Samples — *For complete information, samples, and prices on Armstrong's "Whitall Tatum" Glass Insulators, write or telephone Armstrong Cork Company, Industrial Division, 295 Fifth Avenue, New York 16, New York.*

BUILDING TOMORROW'S LOAD TOGETHER

APR 23 1947
APR 9 1947

FIRST AND ONLY

Explosion-Proof FLUORESCENT LIGHTING for Hazardous Locations

APPROVED BY UNDERWRITERS' LABORATORIES

For safe, modern, efficient lighting wherever danger of explosion lurks—in oil refineries, powder mills, chemical plants, hospital operating rooms, grain elevators, and hundreds of other hazardous locations...and now AVAILABLE FOR IMMEDIATE DELIVERY!

Appleton Explosion-Proof Fluorescent Lighting Fixtures—skilfully designed by Appleton engineers and ruggedly built to meet all code requirements—are approved by Underwriters' Laboratories for Class I, Groups C and D, and Class II, Groups E, F, and G.

Installation is quick and easy; maintenance cost is low. All line connections are made to terminal block in junction chamber; no external seals are necessary. Two 48-inch, 40-watt, T-12 lamps are completely enclosed in genuine Pyrex tubes. Auxiliary fittings, shown at right, simplify installation.

Check the hazardous locations in your community, NOW—You'll find a ready market for Appleton Explosion-Proof Fluorescent equipment!

Sold Through Wholesalers

APPLETON ELECTRIC COMPANY
1705 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Ave. • DETROIT, 7310 Woodward Ave. • CLEVELAND, 1836 Euclid Ave. • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 203 Luckie St., N. W. • BIRMINGHAM, 6 N. Twenty-first St. • MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 418 Bessemer Bldg. • BALTIMORE, 100 East Pleasant St. • BOSTON, 10 High St. • DENVER, 1536 Sixteenth St. PHILADELPHIA, 1217 Race St.

APPLETON FLUORESCENT EQUIPMENT IS *Complete*

"GRU" Series Explosion-Proof Flanged Ceiling Unilet With Fixture Canopy.

Type "LSH" Ceiling Support for Blind or Dummy End—Spans Line Conduit.

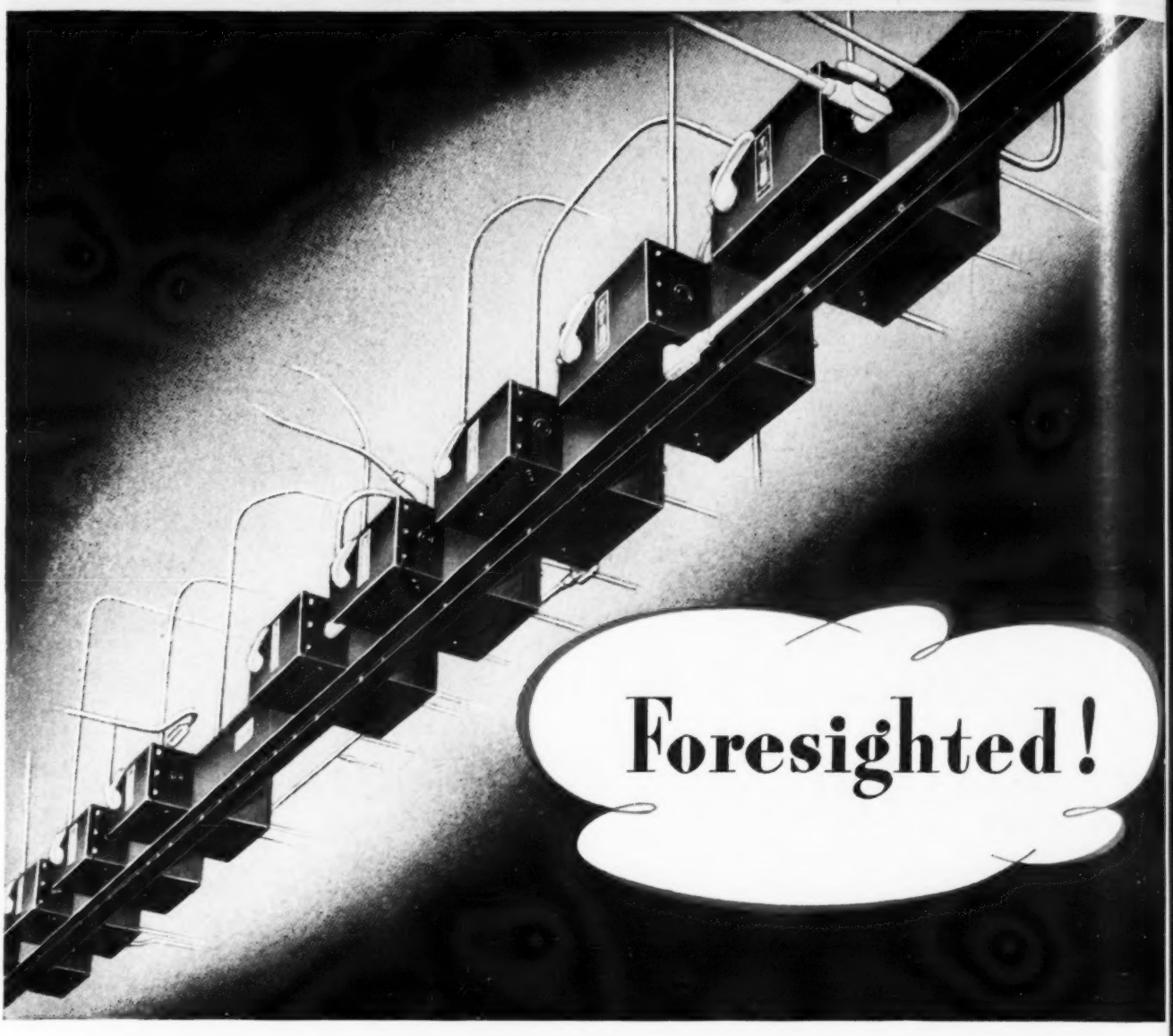
Type "UNY" Explosion-Proof Union Connectors—Fit End Castings of Fixture, Facilitate Mounting.

APPLETON ELECTRIC PRODUCTS

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

APPLETON

Via Graybar—THE DOUBLE-DUTY SOURCE of SUPPLY



BULLDOG BUSTRIBUTION DUCT FOR "PLUG-IN" POWER AT ANY POINT

BullDog has been looking ahead for nearly half a century.

That is why industrial users expect from us one outstanding development after another in electrical distribution. That is why *proved* BullDog equipment will figure increasingly in the changeover plans of leading plants all over the country.

BullDog BUStribution Duct is the original "plug-in" system which gives you electrical power WHEREVER and WHENEVER you need it. Designed to stay modern, its pre-fabricated units can be re-assembled anywhere—new branch circuits added—feeder lines extended. It is 100% salvable, too—no fixed wiring to tear out.

It is not a day too soon to plan peacetime adjustments in your plant. Is your factory power system as *flexible* as your future plans may call for?

BUStribution Duct will take care of your wartime requirements as well as future ones. It will pay you to investigate. Write for illustrated bulletins or consult BullDog field engineers.

BUY WAR BONDS

BULLDOG

ELECTRIC PRODUCTS COMPANY

SALVAGE PAPER

BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN. In Canada: BullDog Electric Products, Ltd., Toronto. Field Engineering Offices in All Principal Cities.

Also Manufacturers of

Vacu-Break Safety Switches—SafToFuse Panelboards—Switchboards—Circuit Master Breakers — BUStribution DUCT, for "plug-in" power—Industrial Trol-E-Duct, for movable "loads."

BUILDING TOMORROW'S LOAD TOGETHER

There is More Reason Today Than Ever Before to Specify Benjamin Lighting Units with *Porcelain Enamel Reflectors!*

The many important advancements made in all types of reflector finishes have left unchanged the 3 BIG REASONS for Porcelain Enamel's TOP RATING!

Advancements in porcelain enameling make possible lighting reflectors with even greater resistance to weather, chipping, acids, thermal shock, etc. However, while these advancements give added reason for its specification, basically the reasons for its TOP RATING remain the same. They are:

1. DURABILITY

TOP RATING in durability goes to porcelain enamel. Reason: porcelain enamel is an inorganic finish, being literally rock fused on steel. Hence, unlike organic finishes, porcelain enamel is *not subject* to oxidation and deterioration from the effects of time, heat, sunlight and atmospheric conditions.

2. REFLECTIVITY

TOP RATING, here, because with porcelain enamel you get a lighting unit which not only has a light diffusing reflection factor of 80% or more, but also one that will *retain* this efficiency for a *life-time*. For, although the better organic finishes now possess initial qualities of reflectivity the equal of porcelain enamel, only porcelain enamel has been so completely time tested. Years and years of service experience prove that porcelain enamel retains its light reflecting qualities throughout a life time of service without appreciable loss.

3. CLEANABILITY

TOP RATING goes to porcelain enamel. Because its dense, glass hard surface prevents dirt and oils from becoming embedded . . . because of its extreme resistance to scratches, marring, chipping . . . because it cannot oxidize or corrode . . . porcelain enamel surfaces are the most easily cleaned; require only soap and water washing.

ENAMEL SEALS AGAINST CORROSION

To be Sure you Get Reflectors Embodying the Latest Developments in Porcelain Enamel . . . Specify BENJAMIN LIFE-TIME PORCELAIN ENAMEL REFLECTORS . . . Years of pioneer leadership in the development of special light reflecting enamels and finer production methods employed in Benjamin's own porcelain enameling plant insures porcelain enamel of a uniform quality that is warranted to meet all recognized industry specifications including those of the RLM Standards Institute.

Remember: For Durability . . Reflectivity . . Cleanability . . *Specify*

BENJAMIN
TRADE MARK

LIFE-TIME PORCELAIN ENAMEL

Lighting Equipment

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

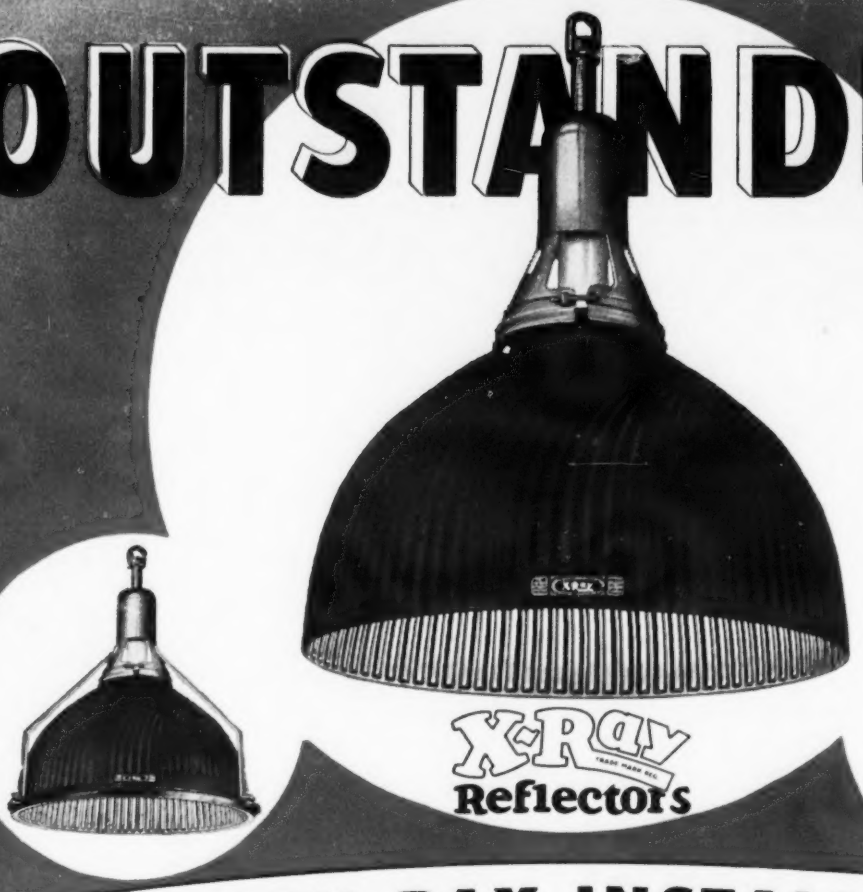
BENJAMIN ELECTRIC MANUFACTURING COMPANY

DES PLAINES, ILLINOIS

1089

Via Graybar — THE DOUBLE-DUTY SOURCE of SUPPLY

OUTSTANDING



FOR HIGH-BAY INSTALLATIONS

When all the selling arguments are weighed against facts in the case, the subject of high-bay lighting efficiency is always in favor of the Curtis "X-Ray" Silver Mirror Glass Reflectors. These reflectors are the result of all the experience of decades of leadership in the lighting field. The function of these reflectors is to deliver more light to the illuminated area . . . and this is a job they do superlatively well.

Any lighting contractor or salesman who is up against competition on high-bay installations can arm himself with engineering facts and figures that will give him a convincing edge every time.

"X-Ray" Industrial lighting reflectors are made in three distinct types and several sizes, each of which has specific advantages for certain purposes. Illustrated above is the largest (750- to 1500-watt) size.

Inform yourself of all of the facts . . . and then go after high-bay lighting for profitable volume sales. Write today for specification sheets.

CURTIS *Lighting*, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

BUILDING TOMORROW'S LOAD TOGETHER

The War Front and the Home Front

It's No Joke!

WHEN WE SAY THAT

COFFING HOISTS

are doing a great job on the war front as well as on the home front

COFFING HOISTS AND UTILITY MAINTENANCE TOOLS are used by more than 86 per cent of the power, light, telephone and other Utility Companies in the U. S. A.

JUST NOW our manufacturing facilities are being taxed to the limit in the production of Coffing "Safety-Pull" Ratchet Lever Hoists for the Army Engineers and other fighting units. The "know-how" and experience we have gained in building hoists for our Armed Forces will enable us to build, immediately after the war is over, better hoists for your peacetime needs.

We now have a new four-page folder describing Coffing products that will be available for the post-war period.

Write for Folder No. 4

COFFING HOIST COMPANY

RATCHET LEVER HOISTS - SPUR GEAR HOISTS - ELECTRIC HOISTS
LOAD BINDERS - DIFFERENTIAL HOISTS - TROLLEYS

DANVILLE, ILLINOIS

Via Graybar — THE DOUBLE-DUTY SOURCE of SUPPLY

THROUGH GRAY-BAR TIPS TOOLS

Tips Hot Line Tool Sets are available through Graybar for live line maintenance work on all types of construction through all transmission voltages. This tool set, displayed on a canvas tool bag, was assembled for changing insulators, cross arms, or poles on a three phase line at an angle pull. The same set is used for straight line work on a single pole, pole with cross arms or H frame suspension construction. Many other combinations are available. The long list includes equipment for dead-end corner insulator changes, line splicing and extension work, tools for changing double and single strings of tower insulators, equipment for substation repairs, etc. All tools are tested to insure protection to the user.

TIPS TAP CLAMPS

For tapping on to live conductors without interrupting service, Tips Tap Clamps have several points of advantage. The gripper makes a three point contact. The eye screw turns up quickly and does not stick. All contacts are screw tight. Clamps have mechanical strength to spare plus high conductivity.

Made in a complete range of sizes and several types.

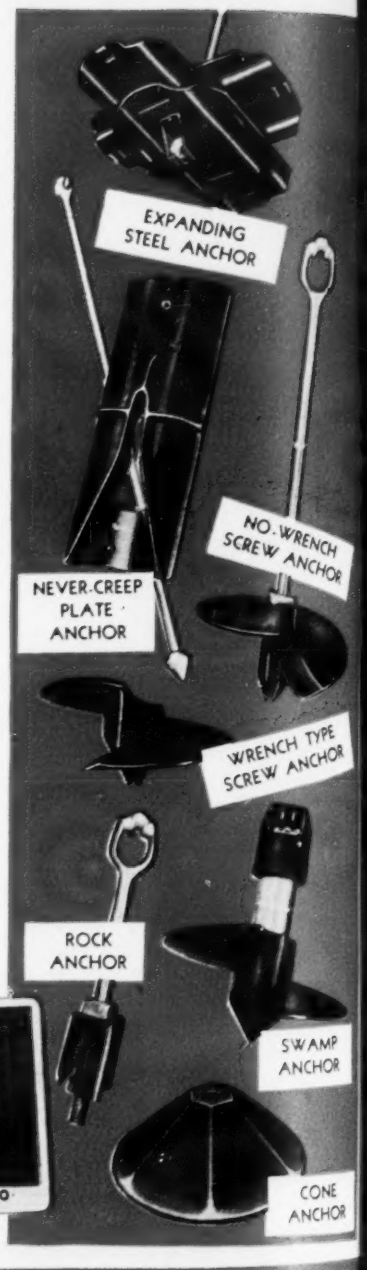
ASK THE GRAYBAR MAN

CHANCE ANCHORS

The world's largest manufacturer of earth anchors supplies your Graybar House with a complete line of anchors for all types of installations. Some of the many types are illustrated at right. Each type is designed to give maximum efficiency under certain soil and guying conditions. A few of them will handle a variety of jobs and in many cases standardization on one or two types is possible and advisable. Where the unusual conditions arise there is always a Chance anchor especially adapted to the conditions. Build security into your lines by selecting the right anchor for every job.

GUY CALCULATOR

To help you in making anchor selections we offer you the Chance Guy Calculator—available without charge. With this calculator it is a simple matter to determine quickly, the size and type of anchor needed for each installation. Every man responsible for the details of line construction should have one of these calculators. Sent on request.



BUILDING TOMORROW'S LOAD TOGETHER

APR 28 1947
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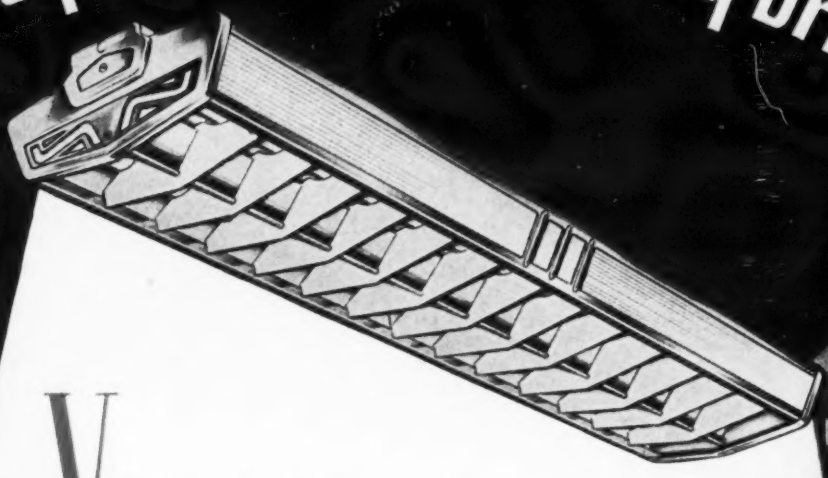
it's easy to see when it's "Day-brite"



VIZ-AID

—especially engineered to provide additional light output in the useful area of illumination—again emphasizes the quality that's easy to see when it's Day-Brite.

With end cut-outs backed with translucent plastic—lateral louvers finished in baked SUPER-WHITE enamel—and V-shaped center louver in Alzak—it is truly a fixture of striking beauty . . . For two 40-watt lamps—surface or suspension mounting, as single units or in continuous installations . . . Send for new VIZ-AID Bulletin 10-B.

Day Brite
LIGHTING FIXTURES

Consult *your nearest Day-Brite Engineering Representative. Each is a qualified illumination engineer, whose business is to help your business.*

DAY-BRITE LIGHTING
Incorporated
5470 Bulwer Ave. St. Louis 7, Mo.

THE SIGN OF *Quality* LOOK FOR THIS LABEL

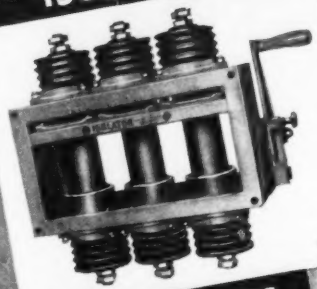
TMs Reg. U. S. and Foreign Countries

Via Graybar —THE DOUBLE-DUTY SOURCE of SUPPLY

ELECTRICAL ENGINEERS EQUIPMENT CO.
THREE E
MELROSE PARK, ILL., U.S.A.
THE MARK OF QUALITY

POWER *Switching* EQUIPMENT AT ITS BEST

ISOLATORS



BUS SUPPORTS

"THREE E" also makes
Air Break Switches
Power Connectors
Switchboard Structural Devices
Spool Insulator Supports
Miscellaneous High Voltage Specialties

Sound engineering and high class manufacturing facilities, plus thirty-five years' experience go into all "THREE E" products.

When you requisition our products you can be sure of their high quality and serviceability.

Many of the notable advances in the Power Switching Equipment field were initiated by "THREE E"—for example:

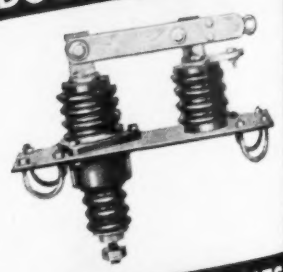
The double blade type disconnect was conceived and pioneered by us. Its advantages were so obvious that this type of construction is now used almost universally.

The *telescoping Isolator* is another "THREE E" contribution. Essentially a disconnect enclosed in insulation, its merits were quickly recognized and its use is now widespread throughout the power industry.

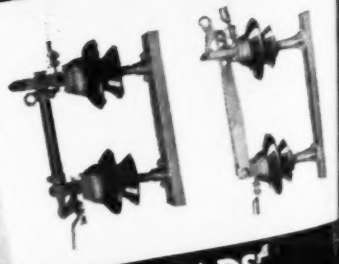
ONLY "THREE E" SUPPLIES IT

Twenty-two conveniently located district representatives and the various GRAYBAR houses will be glad to discuss "THREE E" equipment with you.

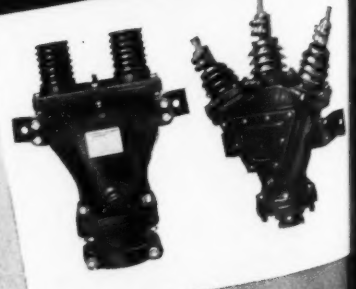
INDOOR SWITCHES



OUTDOOR SWITCHES



POTHEADS



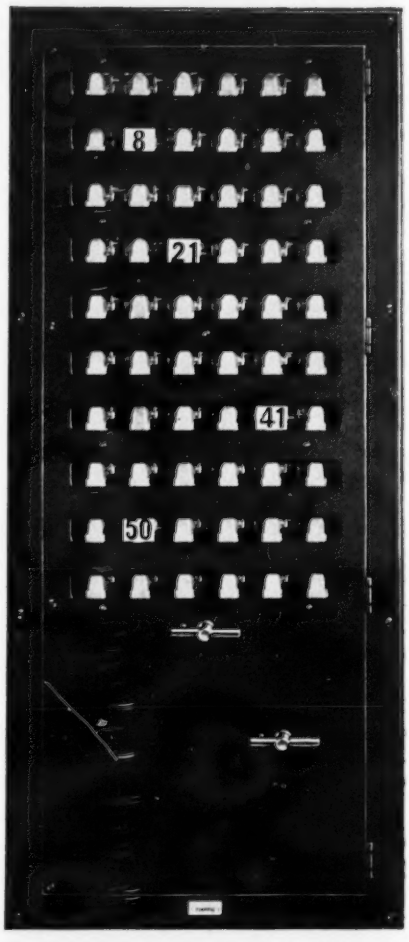
ELECTRICAL ENGINEERS EQUIPMENT CO.
MELROSE PARK ILLINOIS

BUILDING TOMORROW'S LOAD TOGETHER

POWER-HOUSE WATCH DOG!

• Always on guard, Edwards Central Station Alarm Annunciator gives both audible and visible warning when trouble occurs. Not just an adaptation of a low-voltage, residential type annunciator, this has been especially developed to give dependable service on circuits up to 250 V., 1500 V. breakdown test. Large, self-wiping contacts, phenolic (not wood) back, large terminals, and extra heavy drops are just a few of its construction features.

Only two reset devices are employed in Edwards Central Station Alarm Annunciator, one for the audible and one for the visible signals —no toggle switches or reset buttons for each circuit as in other types. As an extra precaution, the visible alarms can not be reset until trouble indicated is cleared. All circuits can operate simultaneously. Edwards Central Station Alarm Annunciator is furnished with bell or horn or buzzer, plus visible drops, but can also be supplied with lamps (opaque or bull's-eye) instead of drops, where necessary.



WARNS OF---

- Overheated Transformers
- Overheated Generator Bearings
- Overheated Motor Bearings
- Overheated Turbine Bearings
- Tripping of Circuit Breakers
- Low Liquid Level in Tanks
- High Liquid Level in Tanks
- Low Pressure or High Pressure
- Operation of Differential Relays
- Operation of Under-voltage Relays

ARMY E NAVY

EDWARDS and COMPANY

Norwalk, Conn. In Canada Edwards and Company, Ltd.

M ★★★

Via Graybar —THE DOUBLE-DUTY SOURCE of SUPPLY

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

War-time anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade malleable iron with superior rust-resistant qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

THE ANCHOR OF MERIT

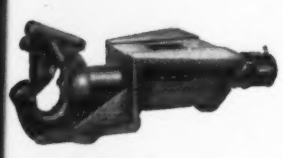
EVERSTICK ANCHOR COMPANY, Fairfield, Iowa

BUILDING TOMORROW'S LOAD TOGETHER

FWD LINE CONSTRUCTION AND MAINTENANCE EQUIPMENT THAT CONSERVES CRITICAL TIME AND MAN-POWER

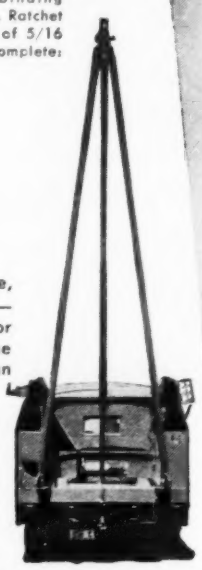
Model 1775 Pole Trailer Especially adapted for high-speed hauling of poles over short and long distances. Because of its wide tread, this unit trails at high speeds without snaking or whipping. Light in weight, two men can easily lift it onto a truck when moving from one operation to another.

Sure Binder (Handiest tool you ever used) The Sure Binder is a portable hand winch for binding bulky loads of all types. Ratchet type drum holds 18 ft. of 5/16 inch cable. Weight complete: 18½ pounds.



Pintle Hooks Provide a sure, connection between truck and trailer — make of truck. Available in sizes for loads of 1 ton or less and up to the type for towing anything that can ed.

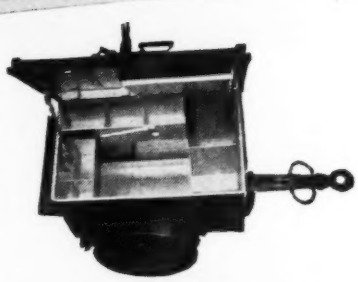
Type Pole Derrick Made of seamless steel tubing properly ted. Available in sizes to handle m 25 ft. to 70 ft. in length.



First Choice OF MORE THAN 150 UTILITIES

FWD offers a complete line of engineered trucks for Utility service. Special power take-offs for operating a winch and boring machine are incorporated into its original design. FWD builds its own cabs and Utility bodies—can furnish conventional or over-engine cabs with seating capacity from 2 to 6 men . . . Write for FWD catalog. "PUBLIC UTILITY TRUCKS THAT FOLLOW THE JOB."

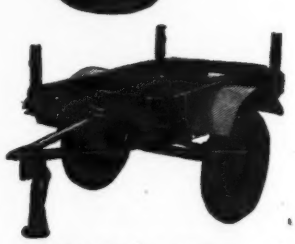
Cable Splicer's Cart—Model S All steel construction—compact—rugged—theft-proof. Compartments for every tool. Folding support leg. Capacity 1000 lbs. Available with either solid or pneumatic tires.



Combination Cable Reel and Pole Trailer This unit has electric steel spoke wheels of integral hub type. Timken roller bearings, and special heat treated chrome vanadium steel springs. All castings are electric steel cast. Axle material is 40-50 carbon steel, specially heat treated. The main frame and cross member 4", 9½ lb. I-beam. All trailers furnished with one set of pole hauling bolsters, and one set of cable reel saddles.

B-6 All Purpose Body

A light weight compact all steel body designed for installation on any half ton chassis. Complete unit weight does not exceed 600 lbs. Storage compartments contain over 54,000 cubic inches. Full height clothing and material compartment. Corrugated steel floor, reduced weight increased strength. Full standardization of design permits easy replacement of damaged body parts or complete sub-assemblies. Tail gate can be secured at 45 degree position, level with floor or fully dropped. Rear ladder bracket removable. Telescoping door stops and solid wood insert converts upper rite door to full length work table and vise holder.



Combination Cargo and Pole Trailer

P8T Series. Available in heavy load capacities of 3100 to 8200 lbs. Extension tongue permits hauling of poles up to 40 ft. Optional electric brakes, side boards, stanchions, etc.

OTHER UTILITY TOOLS

- Earth Boring Machines
- Power Take-Offs
- Pole Rodding Machines
- Low Bed Trailers
- Trailer Hitches
- Cable Laying Plows
- Steel Utility Bodies For Pick-Up Trucks
- Guy Wire Forming and Cutting Tools

SEND FOR LITERATURE

Graybar QUALITY SINCE 1869 — Everything Electrical . . . . THAT IT TAKES TO WIN!

FWD UTILITY SUPPLY DIVISION of the FOUR WHEEL DRIVE AUTO CO., CLINTONVILLE WISCONSIN

Via Graybar — THE DOUBLE-DUTY SOURCE of SUPPLY

GREENLEE BENDER does the job... big or small

"We selected GREENLEE Hydraulic Benders because they seemed the most practical type for construction purposes—light weight, portable, simply operated", reports R. Walters, Purchasing Agent, Ferguson Electric Construction Co., Buffalo, N. Y.

And GREENLEE equipment has certainly delivered as expected . . . efficiently expediting that company's jobs such as the one shown above, where 600 feet of 4-inch conduit were bent, mostly in 10-foot lengths.

You, too, will find that whatever the bending job, large or small . . . pipe up to 4½-inch, rigid and *thin-wall* conduit, tubing, bus-bars . . . there's a GREENLEE to do it better, faster, easier. *One-man* operated for smooth, accurate bends in a few minutes without kinking or damage to conduit. And you'll find that a GREENLEE Hydraulic Bender easily pays for itself the first few times used through valuable savings of your time, manpower, materials.

WRITE FOR THIS FREE BOOKLET TODAY

See your electrical distributor or write for free booklets today. Get Booklet S-116 on complete line of GREENLEE Hydraulic and Hand Benders, Catalog 33E on all GREENLEE time-saving tools for electrical work. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1806 Columbia Avenue, Rockford, Illinois.

Get Ready with Greenlee!

REGISTERED TOOLS

GREENLEE

FOR THE CRAFTSMAN

WORK-SAVING GREENLEE TOOLS Hydraulic Conduit and Pipe Benders • Steel and Copper Tube Benders • Knockout Punches and Cutters • Cable Pullers • Joist Borers • Hydraulic Pipe Pushers • Electricians' Bits • And many others.

BUILDING TOMORROW'S LOAD TOGETHER

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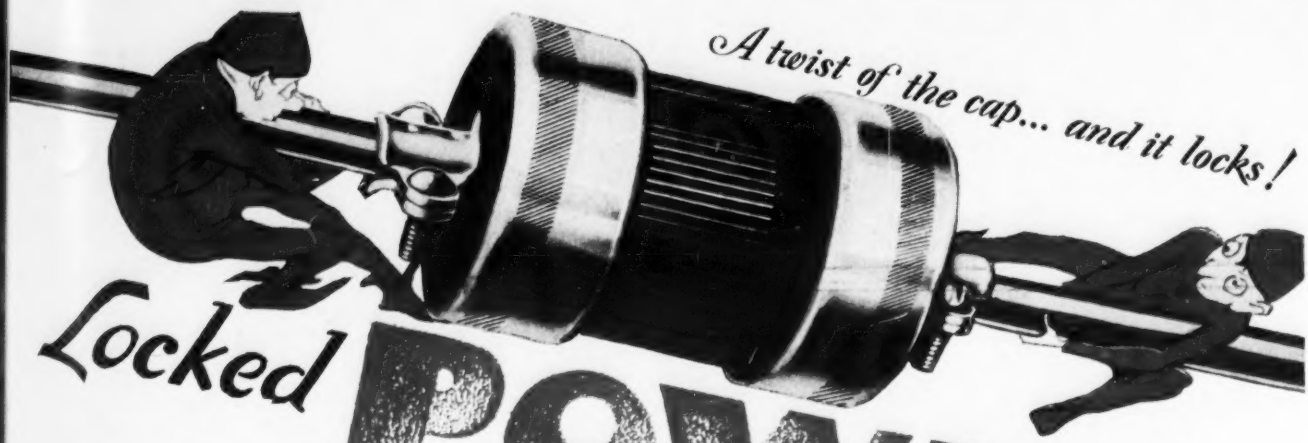
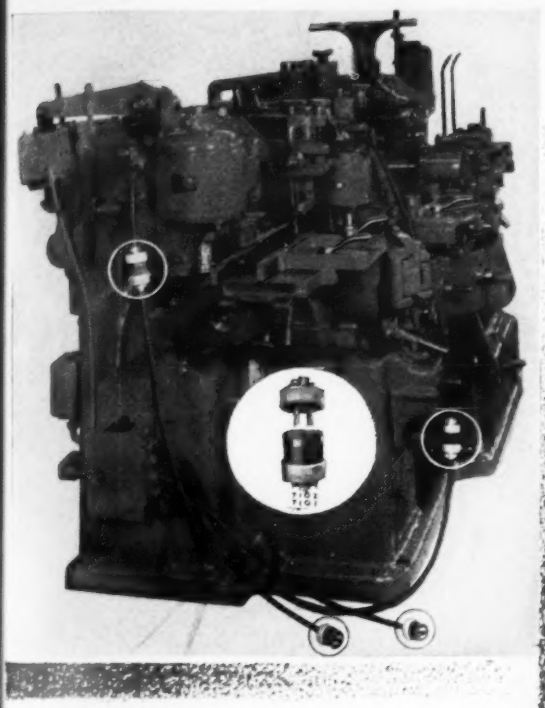


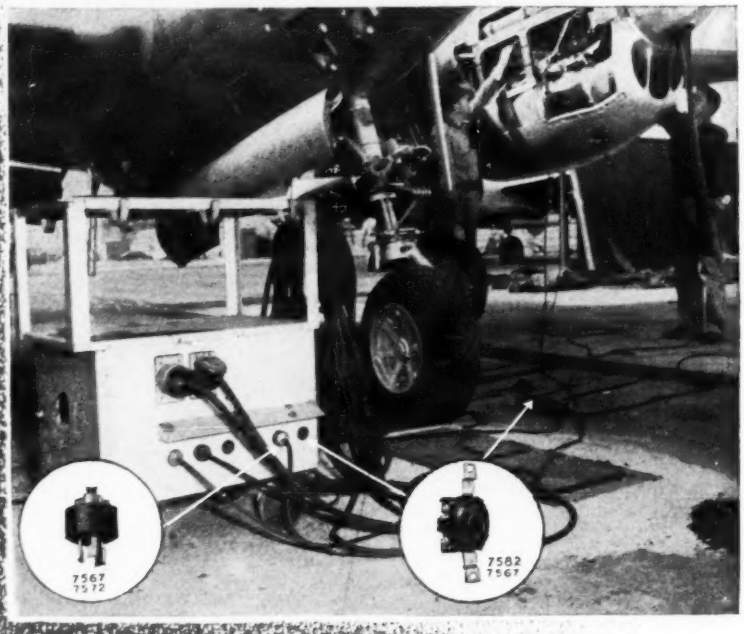
A twist of the cap... and it locks!

Locked POWER



Manufacturers and designers of electrically operated machines look to Hubbell for the finest in wiring devices Time-Proven . . . Battle-Tested.

Proven by "round the clock" service in today's war plants, and on the far-flung battlefronts, *Twist-Lock* Devices will provide an uninterrupted power supply for tomorrow's industrial world.



Twist-Lock Connecting devices meet all requirements for continuous uninterrupted service in the operation of portable electrical apparatus and machinery by providing a locked electrical connection. Positive, mechanical engagement of the cap contacts within the receptacle make accidental pull-out impossible.

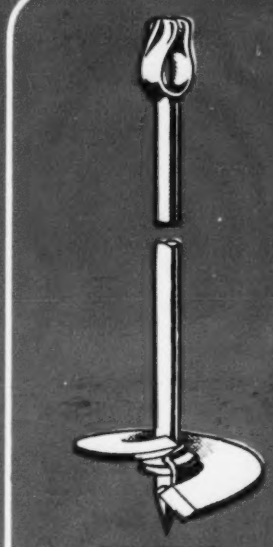
HUBBELL *Twist-Lock* CONNECTORS

HARVEY HUBBELL INC. HUBBELL **BRIDGEPORT, CONN.**

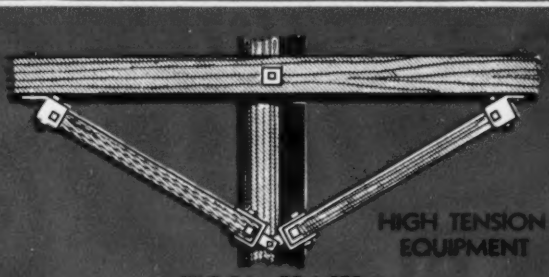
Via Graybar —THE DOUBLE-DUTY SOURCE of SUPPLY

1945 CONSTRUCTION

"Hang the Load on Hubbard Hardware!"



STEELWING ANCHORS
2-3/4" to 10" Diam.
1-1/2 Ft. to 8 Ft. Lengths



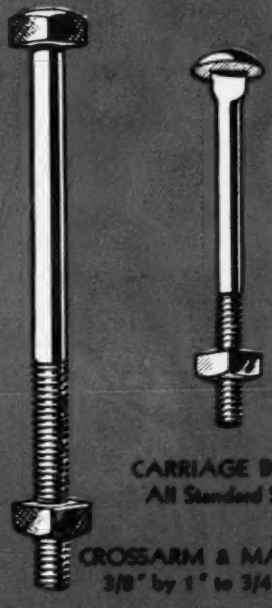
WOOD BRACES
All Sizes—Many Types

HIGH TENSION EQUIPMENT

CROSSARM BRACES
Flat, Ribbed, One Piece, Wood and Steel

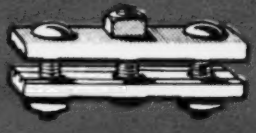
PINS
All Sizes and Styles

GUYEYE ANGLE BOLTS
5/8" by 8" to 1" by 18"



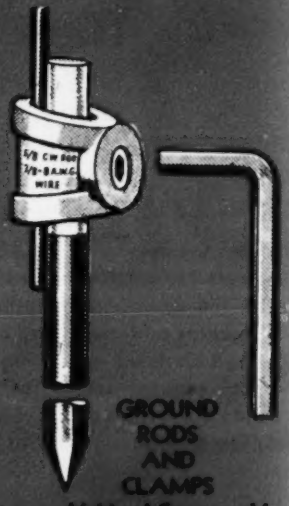
CARRIAGE BOLTS
All Standard Sizes

LAG SCREWS
All Standard Sizes



GUY CLAMPS
1-2-3-4 Bolt Sizes

EYE NUTS
All Sizes and Styles



GROUND RODS AND CLAMPS
Hubbard-Copperweld

CROSSARM & MACHINE BOLTS
3/8" by 1" to 3/4" by 28" Sizes

HUBBARD

HUBBARD AND COMPANY

Pittsburgh • Chicago • Oakland, California

BUILDING TOMORROW'S LOAD TOGETHER

APR 23 1947
APR 8 1947

Improved BALLASTS
FOR FLUORESCENT LIGHTING

COLD CATHODE BALLASTS

The Jefferson Electric Ballast for cold-cathode use incorporates a transformer, two reactors and a capacitor which is enclosed in a case 2½" x 3⅛" x 9½", having a total weight of nine pounds. This Ballast lights two 40-watt tubes with a power consumption of 105 watts and operates from the ordinary 115 volt alternating current lighting system.

Because cold cathode fluorescent lighting is one of the most recent developments in the lighting field, innovations and new ideas in tubing will be introduced. As these lamp developments take place, Ballasts for their operation will be made available.

HOT CATHODE BALLASTS

In the complete line of Jefferson Electric Ballasts, capacities and types for all commercially made fluorescent lamps are included. Correct engineering, control of all steps of production in our own plant, equipment and facilities not matched anywhere—insure highest uniform quality and quiet operation, and long life.

END OR BOTTOM LEADS

Jefferson Electric Ballasts are now available in two-lamp 40-watt sizes designed to bring leads either from the ends or bottom, the latter particularly suited to mounting on narrow wiring channels. This type of Ballast reduces the number necessary to carry in stock.

All types of Jefferson Electric Ballasts are acceptable by lamp manufacturers for operation of their products as evidenced by the E. T. L. certification.

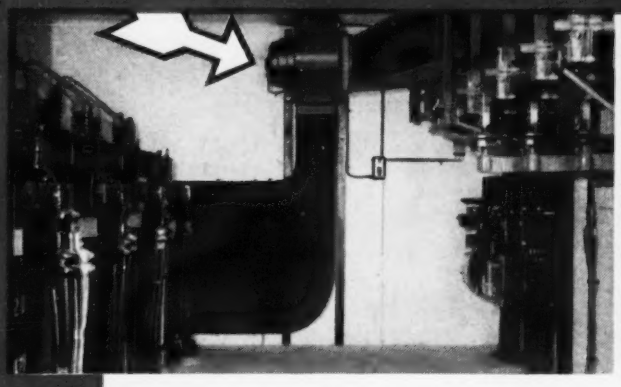
JEFFERSON ELECTRIC

JEFFERSON ELECTRIC COMPANY • BELLWOOD (SUBURB OF CHICAGO) ILLINOIS

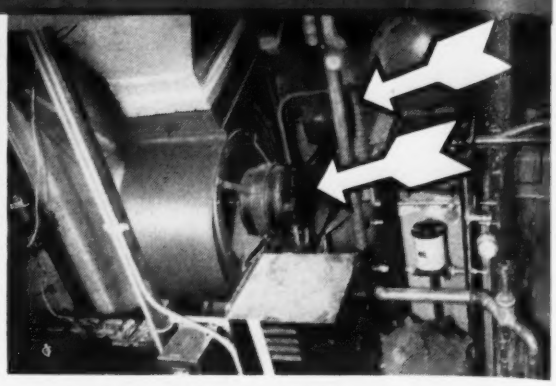
In Canada: Canadian Jefferson Electric Co. Ltd., 384 Pape Avenue, Toronto, Ont.

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY

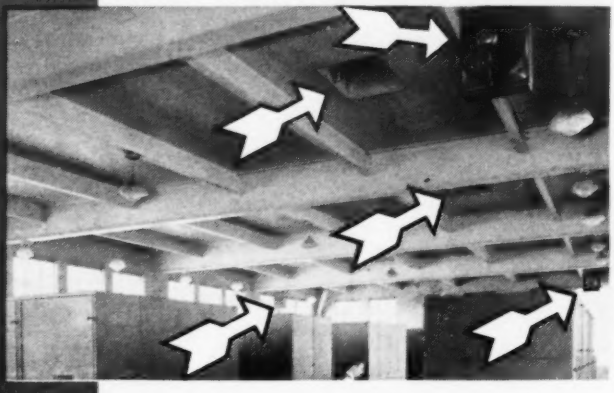
HOW TO SOLVE HEATING, COOLING PROBLEMS

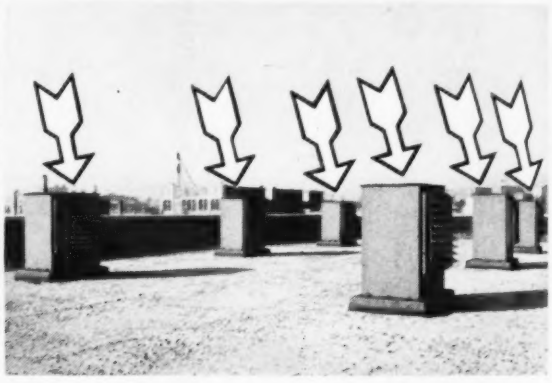


TRANSFORMER VAULT—ILG Direct-Connected Centrifugal Fan in City Hall at Houston, Texas, cools transformers, prevents high ambient temperature. Note compact wall mounting.



STANDBY GENERATING PLANT—Two ILG Direct-Connected Centrifugal Fans cool water from diesel engine for recirculating purposes by drawing in outside air over cooling coils.





SUB-STATION—Nine ILG Electric Unit Heaters automatically maintain a comfortable, healthful temperature throughout the year. Roof view at right shows six of eight ILG Power Roof Ventilators which provide positive all-weather ventilation and exhaust heat generated by electrical equipment in the same sub-station. Power Roof Ventilators consist of ILG Self-Cooled Motor Propeller Fans with Automatic Shutters in weather-tight Penthouses. Results have been highly satisfactory.

ILG

VITALIZED VENTILATION

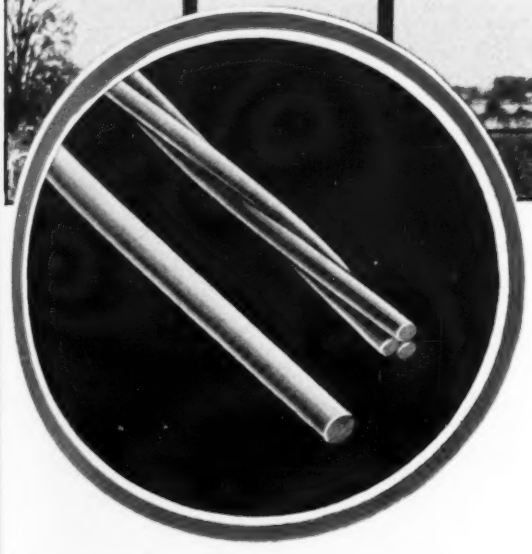
AND AIR CONDITIONING

FREE! Write today for your copy of 88-page Ventilation Work Book.

WANTED: GRADUATE ENGINEERS! for ILG Branch Offices, Research, Engineering Depts. Exceptional opportunities now and post-war for graduates of accredited technical schools. Send details on education, experience, health, age, marital status.

ILG ELECTRIC VENTILATING CO., 2863 No. Crawford Avenue, Chicago 41, Ill. Offices in 40 Principal Cities

BUILDING TOMORROW'S LOAD TOGETHER



Crapo
STEEL CONDUCTOR

IT was inevitable that *Crapo* HTC-130 Steel Conductor should be adopted by many electrical engineers for use as overhead ground wire. Its high tensile strength *plus* ample conductivity make it both practical and economical for the purpose.

The dependability of *Crapo* HTC-130 as overhead ground wire has been established by numerous installations. Its superior strength makes possible long spans with comparatively flat sags and greater clearances. Because of its rugged physical characteristics, it has a high fatigue endurance limit; ability to withstand severe shock and deformation.

Crapo HTC-130 Steel Conductors for overhead ground wires are available in Stranded (3-wire) and Solid types. Physical properties for sizes No. 4 and No. 6 (B.W.G.), in both types, are shown below:

Conductor Size B. W. G.	Type of Construction	Diameter of Conductor (inches)	Minimum Breaking Strength (lb.)
4	3-wire	0.297	5610
6	3-wire	0.252	4295
4	Solid	0.238	5784
6	Solid	0.203	4208

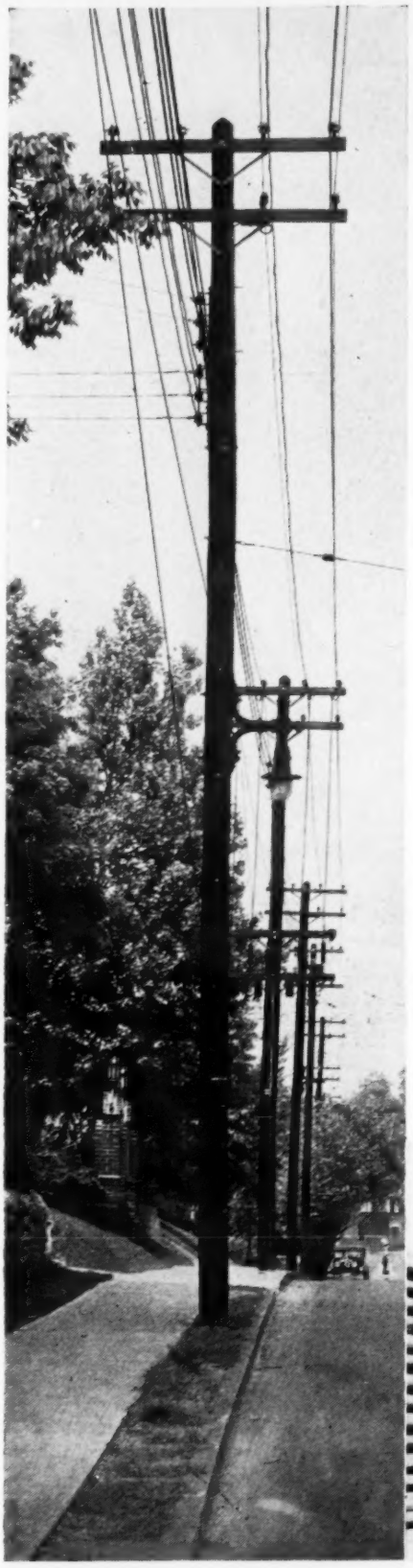
Ask the Graybar representative or write for your copy of Engineering Manual on *Crapo* Steel Conductors!

INDIANA STEEL & WIRE COMPANY . . . . . MUNCIE, INDIANA

Via Graybar—THE DOUBLE-DUTY SOURCE of SUPPLY

DEPENDABLE *Poles* of

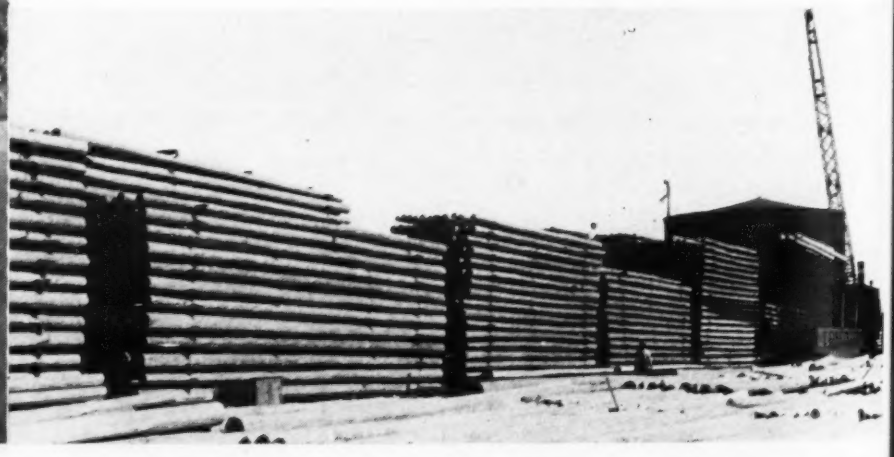
Selected Sound Timber Scientifically Treated



THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 68 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.

Distributed by GraybaR ELECTRIC COMPANY



INTERNATIONAL CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.

Galveston — Beaumont — Texarkana

BUILDING TOMORROW'S LOAD TOGETHER

DISTRIBUTED ONLY THROUGH THE BETTER ELECTRICAL WHOLESALERS

there is a leader commercial unit

for every type installation

is your problem low cost or simple streamlined beauty . . . fast easy installations or coordinated architectural design? Leader commercial fixtures can solve your problem.

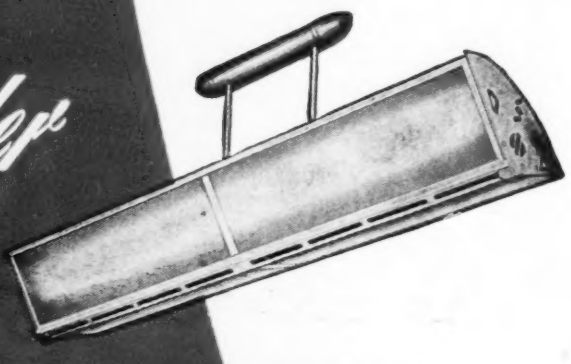
Leader units are specified and installed nationally by leading architects and engineers. Maintenance men find them easy to service, rugged, long lasting and efficient.

Straight line wholesale distributor merchandising methods plus full Leader cooperation assures maximum profits.

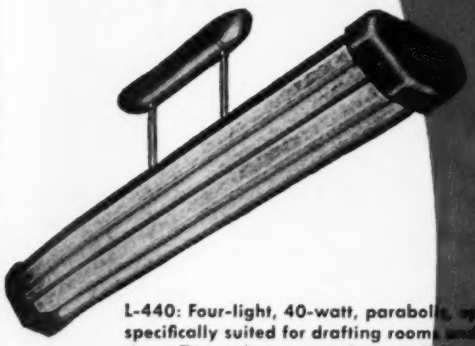
Descriptive literature furnished on request or contact a Leader representative.

Leader

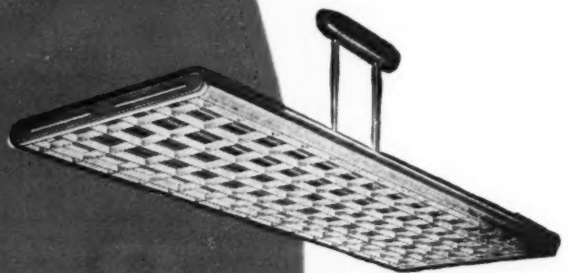
G-440: GLASS ENCLOSED LOUVER UNIT. This unit is especially designed for offices. Exclusive louver design permits full downward light output without side glare. Streamlined and more compact than similar units of equal light intensity.



EL-440: Four-light, 40-watt, glass enclosed louvered unit. A hinged panel with snap fasteners facilitates relamping and servicing. Designed for pendant suspension or ceiling mounting, constructed for individual or continuous run installation.



L-440: Four-light, 40-watt, parabolic, open type unit, specifically suited for drafting rooms and war production offices where general over-all light is required. Available for pendant or ceiling suspension mounting, continuous run or individual installation.



VL-440: THE LEADER OFFICER. Four-light, 40-watt, plastic enclosed, louvered unit, combining the finest in design, construction, and servicing feature, this unit offers the ultimate in lighting equipment. Available for pendant or ceiling suspension mounting, individual or continuous run installation.

LEADER ELECTRIC MANUFACTURING CORP. · 6127 BROADWAY · CHICAGO 40, ILL.

WEST COAST FACTORY

2040 Livingston Street, Oakland 6, California

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY

Play it safe

JUSTRITE

SAFETY FLASHLIGHTS and LANTERNS

Justrite Safety Products are made for safety and ru[gged] service. Ask your Graybar salesman about the[m]. Play safe with safety . . . JUSTRITE.

◀ NO. 17-S THE NEW JUSTRITE HANDY-SAFETY FLASHLIGHT

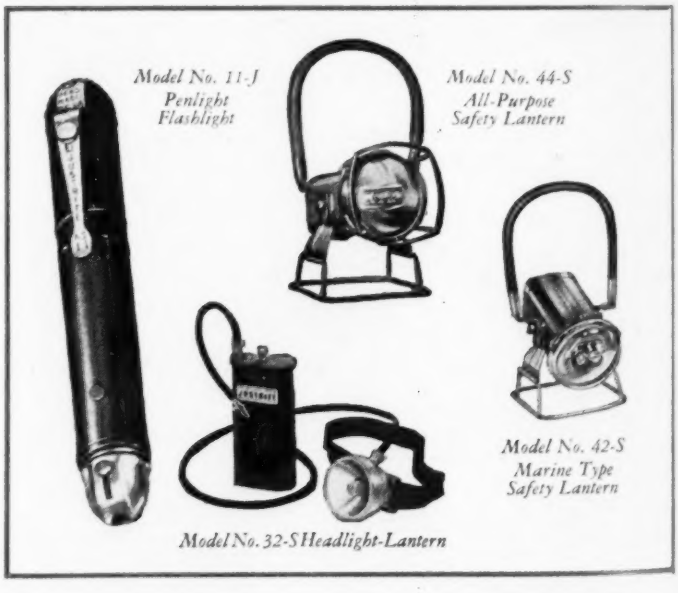
The flashlight that's won instant approval. 1500 candlepower from 3 standard D dry cells. Sturdy plastic case "seals-in" all the famous Justrite Safety Features. Signal flasher in easily replaced switch. It fits in the palm of the hand, on belt clip, finger ring or can be stood on a flat surface. It is absolutely safe in many hazardous locations . . . pump rooms of tankers, Methane Gas and Air Mixtures in mines, oil fields, and chemical plants. Approved for safety by Underwriters' Laboratories, Inc., by U. S. Bureau of Mines, and by Bureau of Marine Inspection and Navigation.

MODEL NO. 11-J. Justrite Penlight . . . a lightweight, handy penlight with clip attached for carrying in your pocket. Popular as an auxiliary light because of its portability. Provides either red or white beam.

MODEL NO. 42-S. Industrial and Marine Lantern . . . has movable steel guard that serves as a stand, movable handle and "safety" type bulb sockets. Meets the safety requirements for Class 1, Group D locations.

MODEL NO. 44-S. All-Purpose Safety Lantern . . . the finest of portable lights. Twin-bulbs with "kick-out" bulb socket safety features. Movable guard-base and adjustable handle. Guards are sparkproofed for safety. Meets the same safety approvals as the flashlight model No. 17-S.

MODEL NO. 32-S. Safety Headlight Lantern . . . leaves both hands free. Equipped with safety-type bulb socket and is designed to meet the safety requirements. Battery case fits the pocket or can be attached to belt clip. Adjustable, moisture proof headband. Made of steel with durable enamel finish and carries 4 regular flashlight batteries. Provides focused beam or floodlight. Available soon!

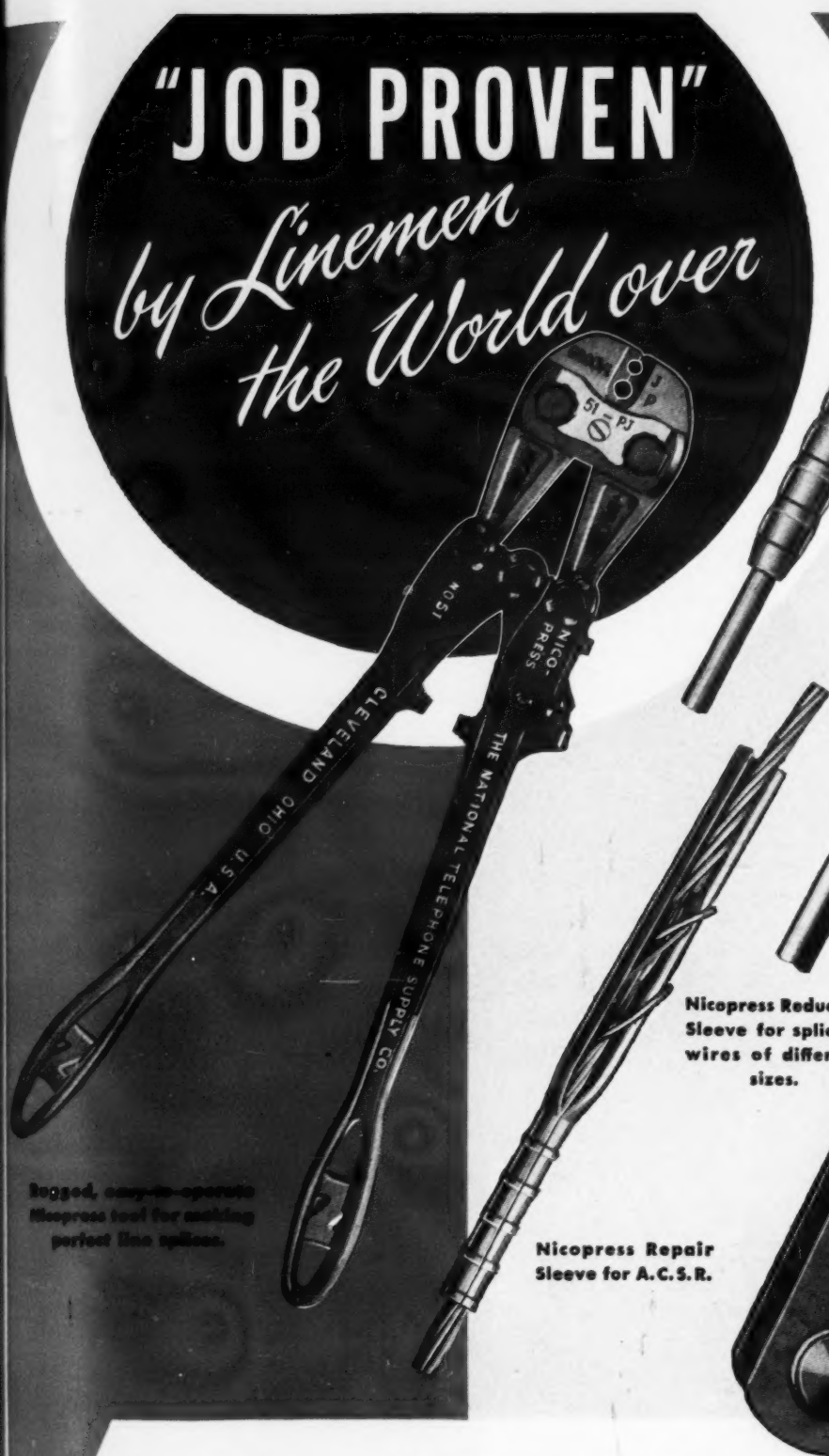


JUSTRITE MANUFACTURING COMPANY
2063 N. Southport Ave., Dept. C-6, Chicago 14, Ill.

BUILDING TOMORROW'S LOAD TOGETHER

"JOB PROVEN"

by Linemen the World over



Rugged, easy-to-operate Nicopress tool for making perfect line splices.

Completed Nicopress joint on line wire.

Nicopress Reducing Sleeve for splicing wires of different sizes.

Nicopress Repair Sleeve for A.C.S.R.

Nicopress Suspension Dead Ends for use with disc insulators.

The National Telephone Supply Company

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Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

Via Graybar —THE DOUBLE-DUTY SOURCE of SUPPLY

Play it safe

JUSTRITE

SAFETY FLASHLIGHTS and LANTERNS

Justrite Safety Products are made for safety and ru[gged] service. Ask your Graybar salesman about the[m]. Play safe with safety . . . JUSTRITE.

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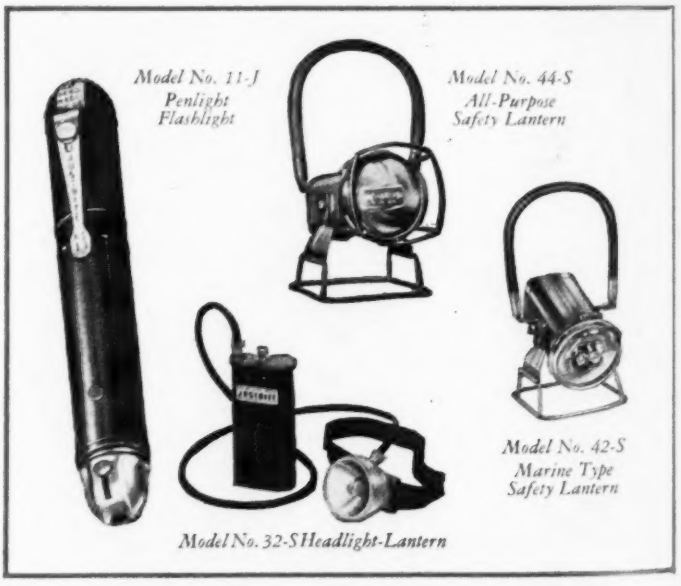

JUSTRITE MANUFACTURING COMPANY
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"JOB PROVEN"

by Linemen the World over

Rugged, easy-to-operate Nicopress tool for making perfect line splices.

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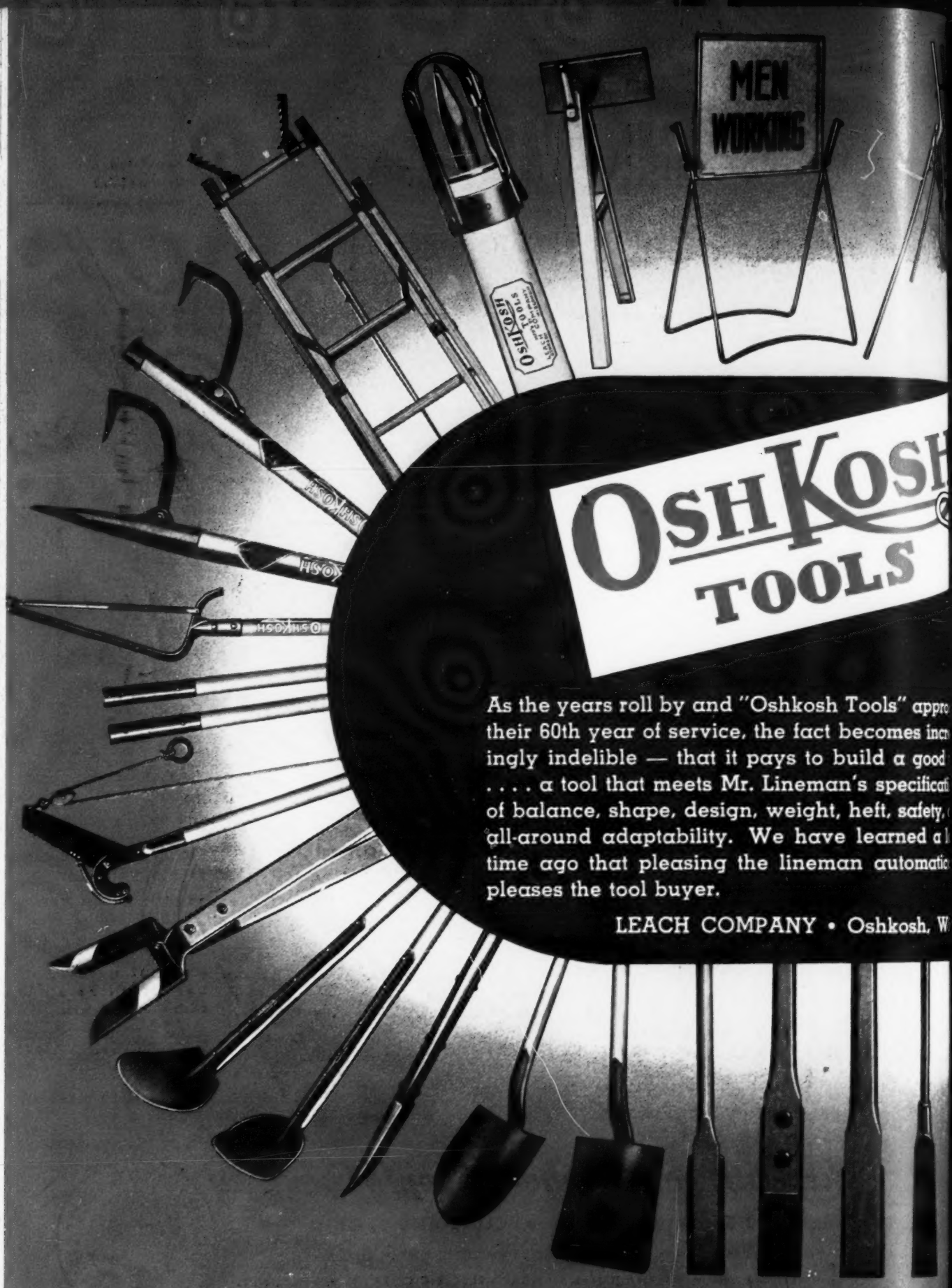
THE NATIONAL TELEPHONE SUPPLY COMPANY

Via Graybar—THE DOUBLE-DUTY SOURCE of SUPPLY



OshKosh® TOOLS

As the years roll by and "Oshkosh Tools" appro
their 60th year of service, the fact becomes incr
ingly indelible — that it pays to build a good
. . . . a tool that meets Mr. Lineman's specificat
of balance, shape, design, weight, heft, safety,
all-around adaptability. We have learned a l
time ago that pleasing the lineman automatic
pleases the tool buyer.

LEACH COMPANY • Oshkosh, W

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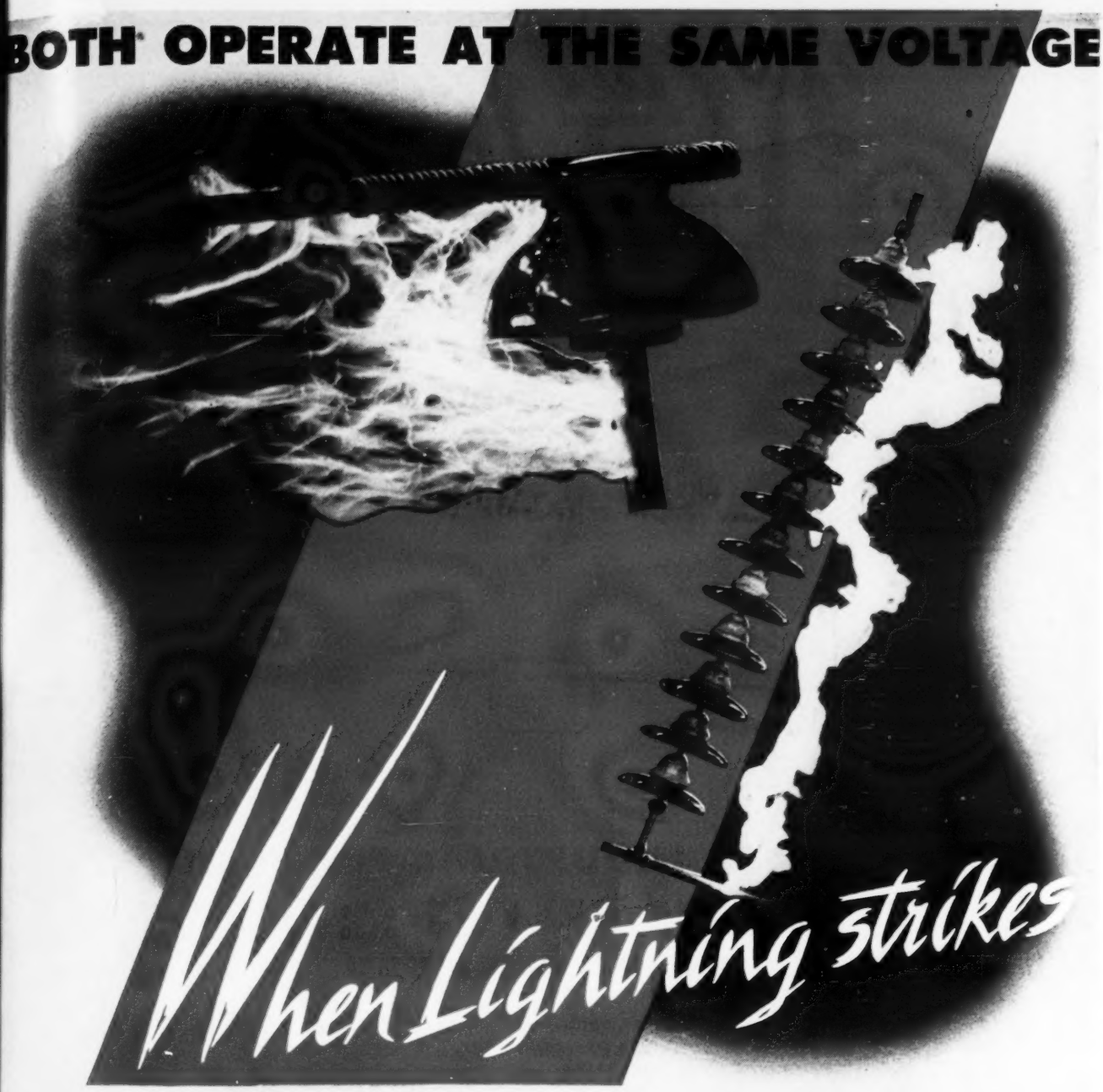
BOTH OPERATE AT THE SAME VOLTAGE



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UNTIL RELIEVED by flashover, a small distribution pintype insulator must withstand the full potential of the same lightning that strikes your best protected transmission lines--and is expected to survive! Consider what this takes in terms of design, materials, workmanship; in just plain knowing how to build a pintype insulator. O-B pintypes embody two vital qualities: a high-voltage background and point of view in manufacture, and a healthy respect for the difficult job they must sometimes do. These hard working insulators that help connect your customers to their power source play a big part in good public relations. They should be the best--in other words, they should be O-B. Order them from your Graybar distributor.

Distributed by GraybaR ELECTRIC COMPANY DISTRIBUTION MATERIALS

Ohio Brass

MANSFIELD, OHIO

2617-H CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

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they all agree on

...because THESE INDUSTRIAL FLUORESCENT FIXTURES OFFER GREATEST ALL-AROUND ADVANTAGES YET CONCEIVED

In MITCHELL-lighted plants everywhere, *workers* see better . . . do more . . . tire less. Up goes morale. Up goes production. But that's not all. *Maintenance men* find MITCHELL units easier to mount . . . simpler to service. *Plant owners* are quick to recognize these benefits. They heartily "O.K." the sound engineering . . . the rugged durability . . . the true economy of these certified fixtures. In the complete MITCHELL line of 2-40 watt, 3-40 watt, and 2-100 watt models they find the right answer for their particular lighting problem.

To the *distributor* and *contractor,* all this means easier sales . . . volume business . . . maximum profits. To the *utility lighting company,* it means increased lighting efficiency . . . greater customer service and satisfaction. Everyone agrees on MITCHELL. *No wonder!*

BUILD SALES WITH THESE AIDS!
Distribute full-size Catalog No. 281 and Pocket-size Catalog No. 290. Each tells full story.

Mitchell Manufacturing Company
2525 CLYBOURN AVENUE, CHICAGO 14, ILLINOIS
West Coast Factory and Sales Office: 1019 N. Madison Ave., Los Angeles 27, Cal.

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HEMINGRAY INSULATORS

Favorably Known Since 1870

"Neither rain, nor snow, nor gloom of night..."

HEMINGRAYS are made as you would like to have them made. Under exacting step-by-step quality production control!

They're tough and strong — built to withstand any change of weather.

They defy rain and snow and sleet. They stand faithfully on guard through the hottest days of summer, the coldest nights of winter.

Many of these famous insulators are still in use after 20, 30, and even 50 years of service.

Dependable, long-life service! That's what you get when you specify Hemingray Insulators!

Hemingrays are sold by principal jobbers and are manufactured by Owens-Illinois, Hemingray Division, Muncie, Ind.

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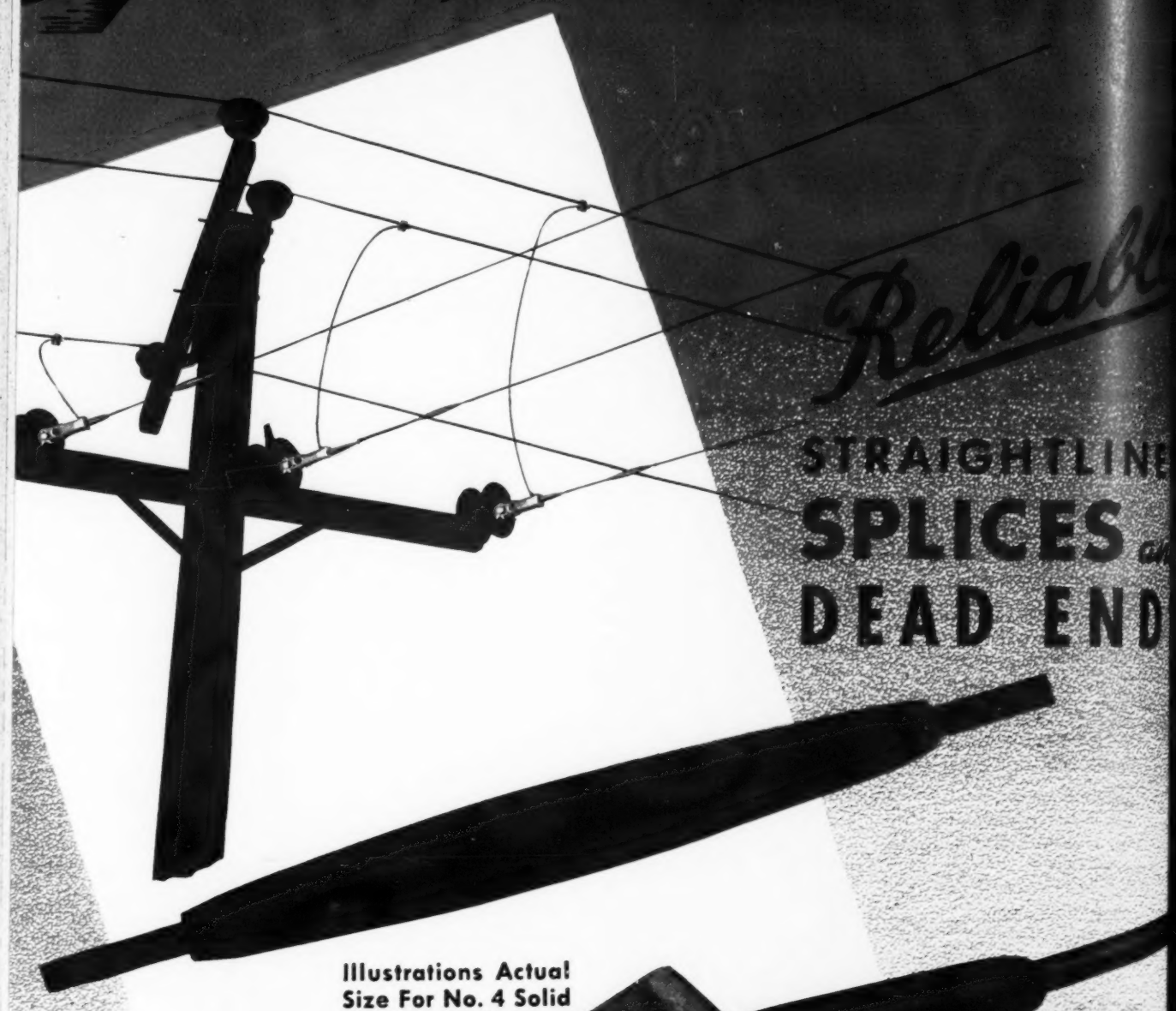
Speed up vital Construction with



Reliable

STRAIGHTLINE SPLICES and DEAD END

Illustrations Actual Size For No. 4 Solid Copper Wire

Furnished in Sizes from No. 8 Strand to 250 MCM Copper

Summary of RELIABLE PRODUCTS

- Split Bolt Connectors—for Copper Wires
- Special Plated Connectors—for Aluminum, Plated or Steel Wires
- Service Entrance Connectors, Flip-on Tap Clamps, Ground Rod Clamps and Solderless Lugs
- Straightline Splices and Dead Ends for Distribution and Transmission Lines
- Splicing Sleeves for Overhead and Underground Construction
- Cable Pulling Grips, Steel or Bronze
- Cable Hangers, Zinc or Copper
- Telephone Protectors, Cable Terminals, Outside Plant Specialties

Reliable ELECTRIC COMPANY

3145 Carroll Ave., Chicago, Illinois

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Smart styling . . . plus

better lighting and ease of maintenance

"Tomorrow's fixtures available today" is the way one lighting authority classifies the SMITHCRAFT line . . . but many of our other friends seem to think of them in terms of "Smart Styling *Plus*". And it is the *PLUS* that particularly merits your attention.

It is generally admitted that SMITHCRAFT FIXTURES are away out in front for Smart Styling — our designers have seen to that! But beautiful designs can get only just so far with you practical men in the industry . . you demand that they also have in abundance those *PLUS* features of simplicity of installation, ease of maintenance, and, above all, conformity to the very latest developments in engineering practice.

SMITHCRAFT FIXTURES are full of *PLUS* features. Each design typifies better lighting — nearly all are exponents of one-man installation — and their engineered construction guarantees the greatest ease of maintenance. For *"Smart Styling Plus"* remember it is the SMITHCRAFT LINE.

— — — — — — *Our New Catalogue* — — — — — —
"SMART STYLING IN COMMERCIAL FIXTURES"
— — — — — *is just coming off the press!* — — — — —
GLAD TO SEND YOU A COPY!

Smithcraft

LIGHTING DIVISION
CHELSEA 50, MASS.

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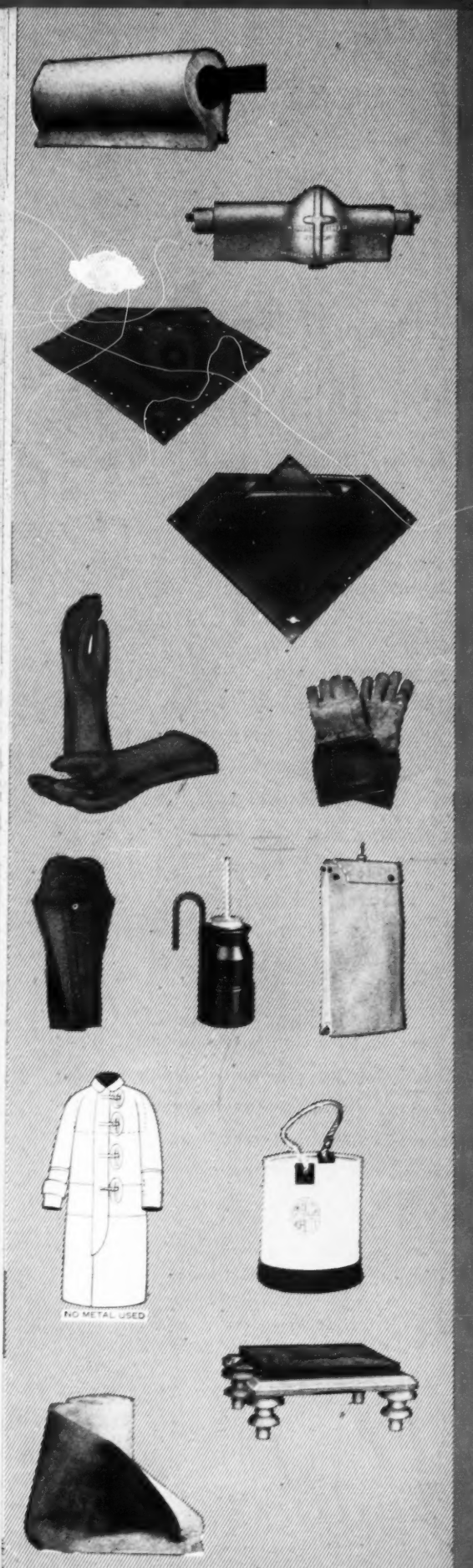

A DEVICE FOR EVERY ELECTRICAL HAZARD

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RUBBER PROTECTIVE DEVI

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APPROVED BY SAFETY ENGINEERS FRO
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SAFETY BY PUBLIC UTILITY COMPANIE
EVERYWHERE. • DESIGNED FOR MAXIMU
DEPENDABILITY AND CONVENIENC
IN USE. • MADE FROM HIGHES
GRADE MATERIALS BY THE PIONEER
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PROTECTIVE EQUIPMENT FOR LINEME

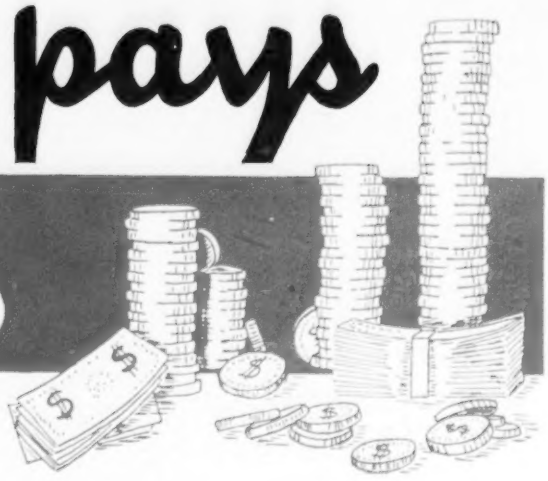
Write for Catalog L-4

W. H. SALISBURY & C

GENERAL OFFICE AND FACTORY
401 NORTH MORGAN STREET, CHICAGO

BUILDING TOMORROW'S LOAD TOGETHER

Research pays Dividends



When the war came along and we were deprived of our supply of deproteinized rubber we all thought, "Well, that's the end of ANHYDREX until after the war." However, our very capable technical staff came through with an ANHYDREX Buna rubber insulation that we are proud to offer.

This new insulation has a water absorption rate of only .020 grams per square inch of exposed surface. Add to this freedom from electrolysis, installation with or without ducts and you have a combination that's pretty hard to beat.

If you have underground power, control or submarine cable problems that are bothering you, tell your Simplex Engineer about them. He will be more than glad to help you at no obligation whatsoever and you will be assured of getting the latest and most modern engineering advice on your problem.

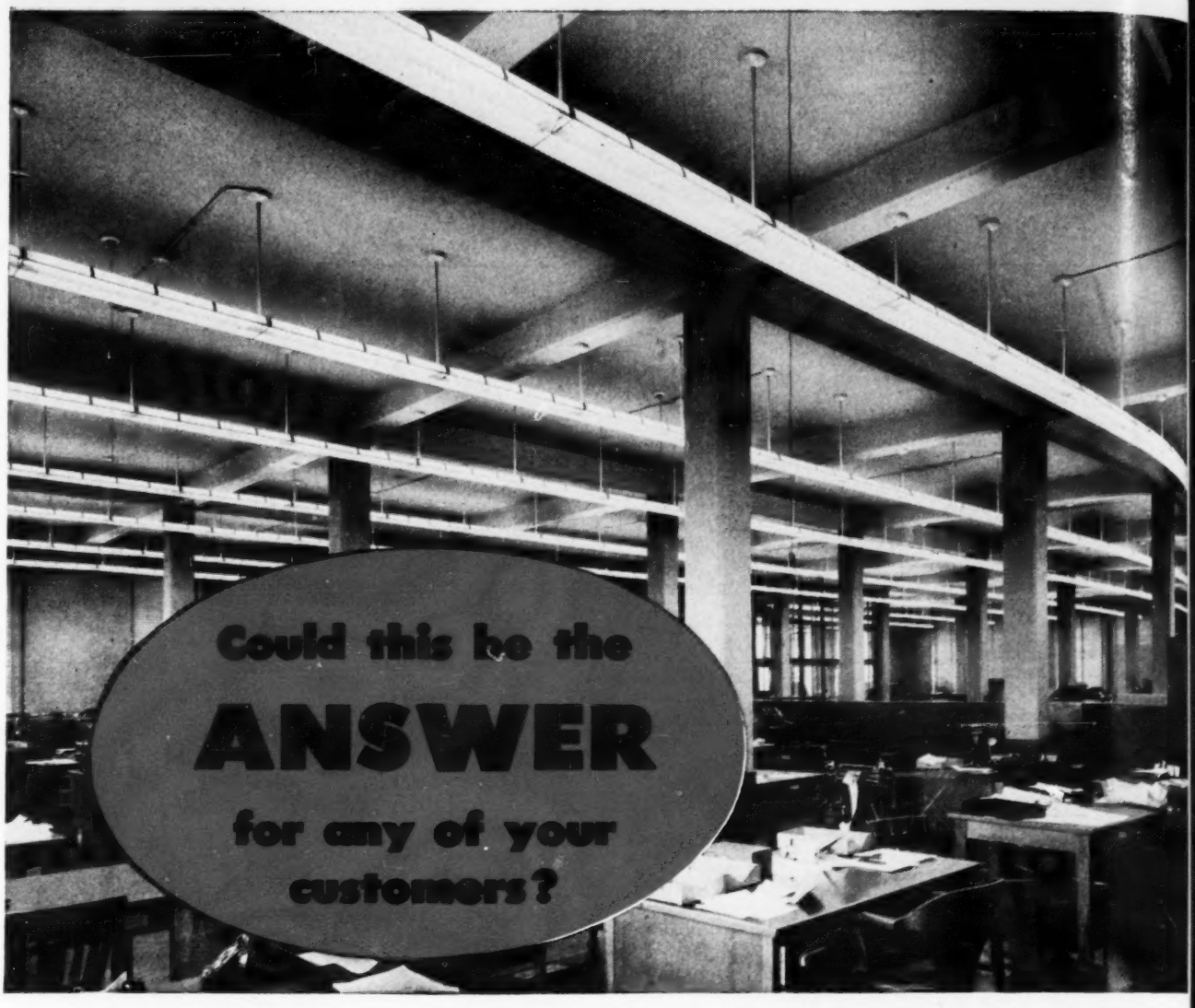
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

ARMY (E) NAVY

M★★★

Simplex WIRES and CABLES

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY



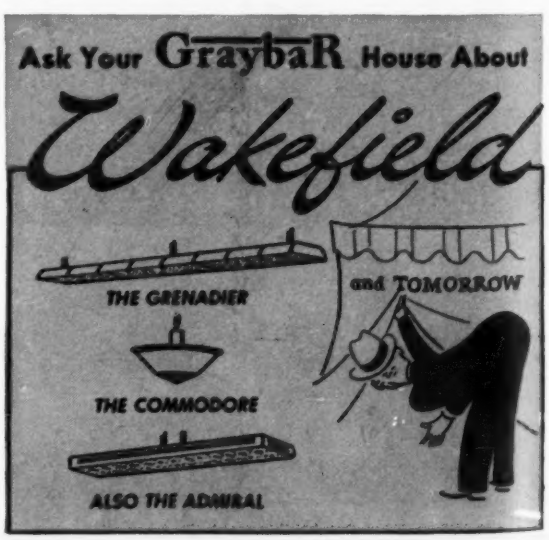
Office Problem:
Paper work volume increasing but errors increasing, too! Management question—how can work be handled with fewer errors?

Indicated Solution:
Better lighting . . . but . . .

Limitations:
Rewiring difficult or impossible because of reinforced concrete ceilings. Outlets inadequate in number. Heavy beams that complicate structural changes.

How It Was Solved:
Wakefield worked with Graybar and the utility. You see the result above. Continuous rows of GRENADIERS (PG2488) provide more light on work and better light throughout the office. (Properly lighted walls and ceilings, plus light on work, mean greater eye comfort, less eyestrain.) GRENADIERS make it easy for existing outlets to handle the job without a "forest of re-wiring" because *they provide their own wireway to carry feed wires.* Wakefield's adjustable hangers facilitate installation; make ceiling irregularities no problem. Result: six months later an average of 35 footcandles on desktops.

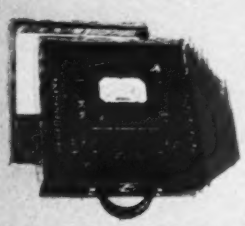
Perhaps there's a suggestion in this for you and your customers. Wakefield and Graybar will be glad to work with you on lighting for office or drafting room. The F. W. Wakefield Brass Co., Vermilion, Ohio.



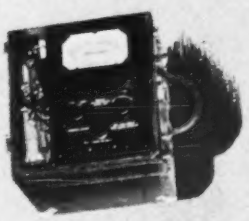
BUILDING TOMORROW'S LOAD TOGETHER

Instruments FOR ALL PROBLEMS OF RECONVERSION

Utilities, manufacturers and maintenance contractors will find, within the broad WESTON line, instruments specifically suited to *all* problems of electrical reconversion . . . whether they involve quick repairs, rewiring for heavier loads, relocation of equipment, new testing stands or laboratory installations, improved lighting, as well as for all electrical and electronic maintenance needs. Literature, or engineering cooperation on any instrument problem, is freely offered. Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, N. J.



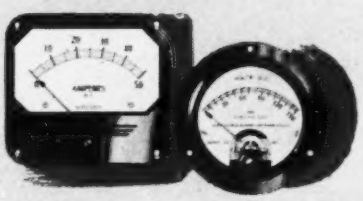
(MODEL 785) INDUSTRIAL CIRCUIT TESTER . . . the most versatile portable tester for laboratories, and plant maintenance, where an ultra-sensitive instrument is required. Provides 27 AC and DC voltage, AC and DC current, and resistance ranges. (dc sensitivity 20,000 ohms per volt.)



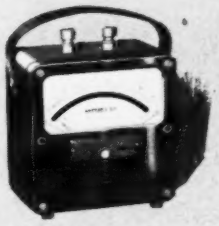
(MODEL 796) INSULATION TESTER . . . a direct-reading self-contained resistance tester that eliminates hand cranking. Tests up to 200 megohms at test potential of 350 to 500 volts dc., current at terminals only a few microamperes. Ranges 0-20-200 megohms, full scale . . . 0-.5-5 center scale.

(MODEL 697) VOLT-OHM-MILLIAMMETER . . . combines a selection of AC and DC voltage, direct current, and resistance ranges in a pocket-size meter. Ideal for maintenance testing and inspection needs.

(MODEL 633) AC CLAMP AMMETER . . . for quick, easy current measurements on insulated or non-insulated conductors. The clamping jaws are simply clamped around the conductor, and readings taken. Circuits are never disturbed. A real time saver in electrical maintenance.



PANEL AND SWITCHBOARD INSTRUMENTS . . . available for all AC and DC requirements, in all types, sizes and ranges. The complete line is fully described in the WESTON Panel Instrument bulletin. Send for your copy.



(MODEL 430) AC AND DC TEST INSTRUMENTS . . . combine dependability, ruggedness, compactness and scale readability. Equipped with hand calibrated, mirror scales. Available for AC and DC requirements, and as DC and single-phase AC Wattmeters.

(MODEL 703) SIGHT METER . . . direct-reading, pocket size meter calibrated to measure light values in foot-candles, or by seeing tasks. Equipped with the WESTON VISCOR* filter, it measures all light values direct, without correction factors.

Weston *Instruments*

ALBANY • ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • JACKSONVILLE • KNOXVILLE • LOS ANGELES • MERIDEN
MINNEAPOLIS • NEWARK • NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH • ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE

In Canada, Northern Electric Co., Ltd., Powerlite Devices, Ltd.

Via Graybar —THE DOUBLE-DUTY SOURCE of SUPPLY

A *Skilled Lighting* System will need No Reconversion!

Equip plants now, to speed today's and tomorrow's production

Here's a wartime plant modernization that will carry over all its efficiency-boosting benefits into peacetime operations . . . without any additional purchases, remodeling or re-tooling!

A modern high-intensity lighting system equipped with Wheeler "Skilled Lighting" Fixtures is a permanent plant improvement. It will pay dividends in higher worker-output, improved product-quality, lower accident rates and better morale, for years to come.

Wheeler Lighting is *skilled lighting* because it's designed with the know-how and vision of engineers who have specialized in good lighting for more than 60 years. It's built to highest RLM standards of construction, durability and light-output per watt.

Write for details of Wheeler's complete line of Incandescent and Fluorescent Fixtures for industries. Wheeler engineers will be glad to help you plan correct layouts. **Wheeler Reflector Company, 275 Congress Street, Boston 10, Mass.** Also New York. Representatives in principal cities.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Wheeler Incandescent Fixtures for any industrial use. RLM Solid Neck Standard Dome is only one of many types. Complete range of standard shapes . . . dome, angle, etc. Provide maximum lighting efficiency for lamps from 75 watts to 1500 watts.

Wheeler Heavy Duty Fluorescent Fixtures offer economical, high-intensity lighting for individual installation or continuous runs. Porcelain enameled steel reflectors with high reflection efficiency. Made for two 40-watt, three 40-watt and two 100-watt lamps.

Wheeler Series II Dust-Tight Units for Class II "Group G & F" and Class III and IV Hazardous Locations. Hinged cover protects lamps from dust and vapors. Supplied with Double-Thick Plain Clear Glass, Water-White Plate Glass or Tempered Clear Safety Plate Glass.

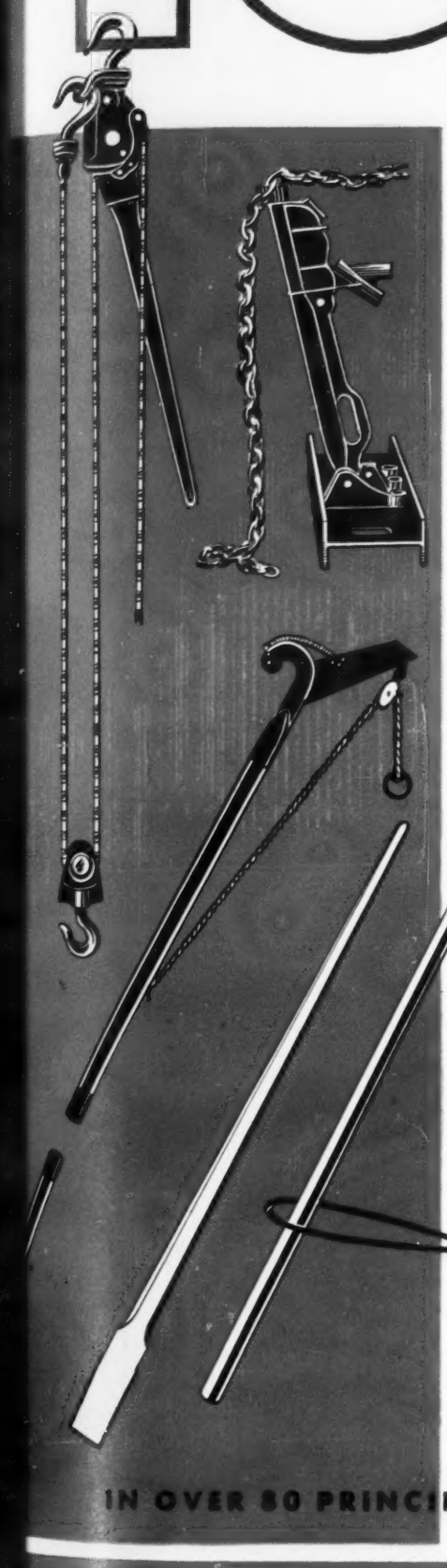
Wheeler Vapolux Reflectors for incandescent lighting in hazardous locations. Dust-tight and vapor-proof . . . highly durable and easy to install and service. Made in standard styles for lamps from 100 watts to 500 watts.

Wheeler REFLECTOR COMPANY

LIGHTING EQUIPMENT SPECIALISTS SINCE 1881

BUILDING TOMORROW'S LOAD TOGETHER

TOOLS



From pliers to pike poles — clamps to cable cars — tree trimmers to tamping bars, Graybar offers first-quality tools for every power line job. These tools are designed specifically to help linemen do the best work with the greatest safety. Special tools are available for hot-line jobs.

By making Graybar your headquarters not only for tools — but for hardware, poles, crossarms, strand, insulators, pins, and accessories — you will always be sure of getting the right materials for each job. *Graybar Electric Company, Graybar Building, New York 17, N. Y.* 4535

Via GraybaR
...First Source of Pole-Line Supplies

IN OVER 80 PRINCIPAL CITIES

Via GraybaR —THE DOUBLE-DUTY SOURCE of SUPPLY

GIVE AMERICA THE

Power to Build Anew

IN OVER 80 PRINCIPAL CITIES

NEWS ABOUT PEOPLE

Rogers Named President of Birmingham Utility

William McMillan Rogers has been elected president and chairman of the board of the Birmingham Electric Co., succeeding Charles E. Oakes, now president of Pennsylvania Power & Light Co., Allentown, and Charles S. Thorn has been elected vice-president and general manager.

W. McM. Rogers

Election of Mr. Rogers brings to the presidency of Birmingham Electric an attorney who has specialized in the field of utility law and who has handled the legal affairs of the company for a number of years as a member of the law firm of Bradley, Baldwin, All & White. He is widely known in utility circles, having represented in rate matters and special litigation a number of utilities, including the Duke Power Co., Carolina Power & Light Co., South Carolina Power Co. and South Carolina Electric & Gas Co. Before receiving his law degree, he was graduated from Mississippi Agricultural & Mechanical College in electrical engineering.

C. S. Thorn

Mr. Thorn had a background of public utility experience when he joined Birmingham Electric in 1927. Starting as supervisor engineer he became chief engineer in 1929 and in 1935 was elected to the position of vice-president. Mr. Thorn is a member of the American Institute of Electrical Engineers.

•

▶ DOUGLAS W. BONNER, merchandising and power sales supervisor for the South County division of the Narragansett Electric Co., Westerly, R. I., since 1942, has been appointed merchandising supervisor for the seven New England Power System companies in the central district with headquarters at Leominster, Mass. After a year with the Westinghouse company in New York, Mr. Bonner joined the Narragansett company's sales staff at Westerly in 1930, becoming merchandise sales supervisor for the South County division in 1930.

▶ HARRY S. SLADEN, vice-president of the Kansas Gas & Electric Co., Wichita, has asked to be relieved of his responsibilities as an official of the company. Mr. Sladen has rounded out 35 years of service. He first joined the company in 1910 as Wichita manager. Promotions came rapidly, and he became assistant general manager in 1911, general manager in 1917 and was elected vice-president and general manager in 1933.

▶ E. A. STANGER has been appointed chief electrical engineer, Southern Canada Power Co., Montreal, and RODOLPHE MELOCHE has been made distribution engineer.

A. Wilson Made Manager of Electric Operations

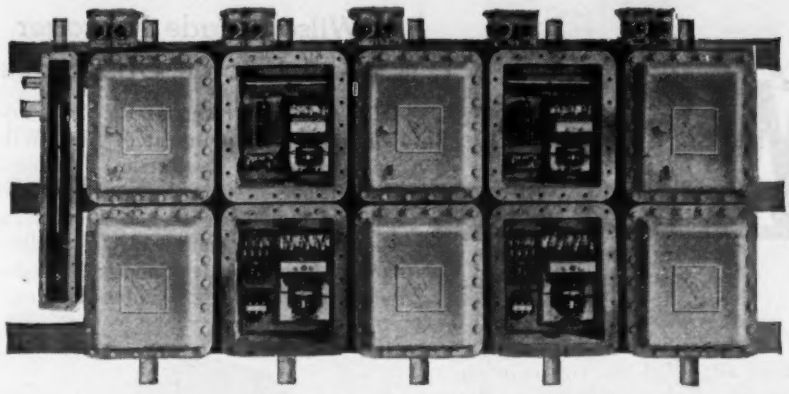
Philadelphia Electric Co. has announced the appointment of Alex. Wilson as manager of electric operations. Mr. Wilson's first employment with the Philadelphia utility was in 1911, as a mechanic in the station electrical division. After other engineering assignments, in 1918 he was appointed engineer in charge of construction of the Chester, Delaware and Richmond steam generating stations and the Conowingo hydroelectric development. In 1927 he was made manager of the mechanical division and in the following year he became assistant chief engineer.

A. Wilson

In 1930 Mr. Wilson was promoted to assistant to the vice-president in charge of operations. He was made operating manager in 1936, and continued in that position until 1938, when he was appointed manager of the electric operations department. In 1941 Mr. Wilson was appointed manager of the newly created transmission and distribution department, the position he held at the time of his new appointment.

•

▶ J. T. LOGAN, operating engineer, Georgia Power Co., has resigned. The duties and responsibilities of Mr. Logan will be taken over by R. O. CONWELL as system operator and by R. J. COOPER, as protection engineer, both reporting to the vice-president in charge of operation. F. J. ZARA will succeed Mr. Cooper as test engineer supervisor, reporting to Mr. Cooper. Mr. Cooper will have supervision of the application, installation and maintenance of protective and control relays, meters, automatic electrical control apparatus and related devices at the generating plants and substations of the company, as well as of other associated technical duties. Mr. Conwell, as in the past,



EXPLOSION PROOF CONTROL PANEL FOR FIVE GROUPS OF ELECTRICAL STRIP HEATERS INSTALLED ON ETHYLENE GAS PIPE LINES & DRUMS. THE PANEL MADE UP OF FIVE SECTIONS & EACH SECTION CONTROLS SEPARATELY ONE GROUP OF HEATERS. A MOTOR OPERATED SEQUENCE SWITCH & TEMPERATURE INSTRUMENTS (NOT SHOWN) OPERATES THE VARIOUS CONTACTORS & RELAYS SO THAT THE HEATERS ARE CONNECTED IN PARALLEL OR IN SERIES DEPENDING ON THE TEMPERATURE REQUIREMENTS.

R&S CUSTOM BUILT PANELS

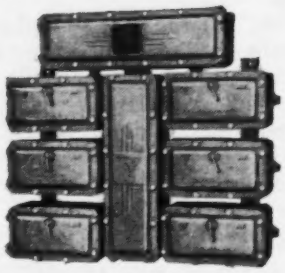
FOR ALL HAZARDOUS AREAS

Over the years R&S has pioneered in the development and standardization of precision-built control equipment in keeping with industries' expanding requirements of new processes and codes.

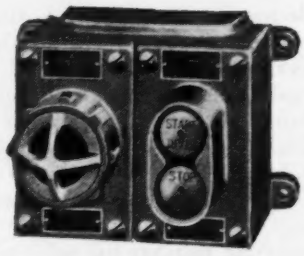
A large variety of standardized explosion-proof enclosures is available for grouping and assembly of control and power units in panel form, at minimum cost and without the usual delay of special designs.

R&S Standard Enclosures have wall sections permitting a great variety of conduit arrangements and sizes to suit job requirements. This simplifies material lists and reduces inventories caused by field changes.

Ask for the 300-page R&S Catalog.



CIRCUIT BREAKER PANEL FOR LIGHT OR POWER



PUSH BUTTON STATION WITH PILOT LIGHT

Since 1902

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RUSSELL & STOLL COMPANY

EXPLOSION-PROOF, WATER-TIGHT, INDUSTRIAL LIGHTING FIXTURES AND EQUIPMENT. AUTOMATIC LOCKING "EVER-LOK" CONNECTORS

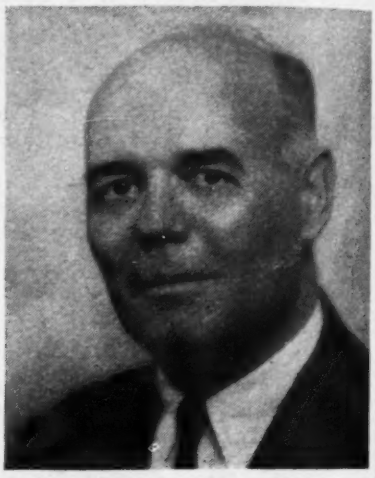
125 BARCLAY STREET · NEW YORK 7, N. Y.

but with more direct responsibilities, will have general supervision of system operation with respect to load dispatching and all related activities. He will also supervise and coordinate interchange power operations between the company and neighboring utilities.

•

O. K. Greene Assigned New Engineering Duties

O. K. Greene has been appointed engineer of transmission and distribution of the Union Electric Co., St. Louis, Mo. Mr. Greene went to Union Electric from Laclede Power & Light Co., which was recently taken over by Union. He has been located in the offices of the superintendent of transportation and distribution.



O. K. Greene

In his new capacity, Mr. Greene will be concerned with coordinating transmission and distribution operations of the former Laclede properties through the established functional departments of the transmission and distribution division.

•

C.V.P.E. Appointments

E. C. Brown has been appointed manager of the Connecticut Valley Power Exchange, following several years' service as acting manager during the absence of C. W. Mayott in government service. Mr. Mayott has returned to Hartford and has been assigned special work for the Hartford Electric Light Co. in the technical division of that utility. Delmont Stremlau has been named assistant manager of the Exchange, with headquarters at its Sheldon Street offices in Hartford. Mr. Brown is well known in the eastern utility field and has been active in the System Operators Club of New England and actively concerned with interconnection problems in the northeast

Without Exception

these molded, oil-paper capacitors meet the performance requirements of American War Standard C 75/221.

AVAILABLE IN STANDARD RATINGS		
CAPACITANCE MMFD.	**VOLTAGE D-C WKG.**	**TYPE DESIGNATION**
SIZE: 13/16 x 13/16 x 19/64 INCHES		
3000	800	CN35-302
6000	600	CN35-602
10000	600	CN35-103
20000	300	CN35-203
SIZE: 11/16 x 29/64 x 7/32 INCHES		
1000	400	CN20-102
2000	200	CN20-202
3000	200	CN20-302
6000	200	CN20-602
10000	120	CN20-103
Other capacitances from 1000 mmfd. to 50000 mmfd., available in Tobe DP style, conform to the same high quality standard.		

★ **MOISTURE SEAL** . . . adequate to ensure compliance with thermal cycle, immersion, and humidity requirements.

★ **SHUNT RESISTANCE** . . .
40,000 megohms at 25° C.
1,000 megohms at 85° C.

★ **WORKING TEMPERATURES** . . .
−55° C. to + 105° C.

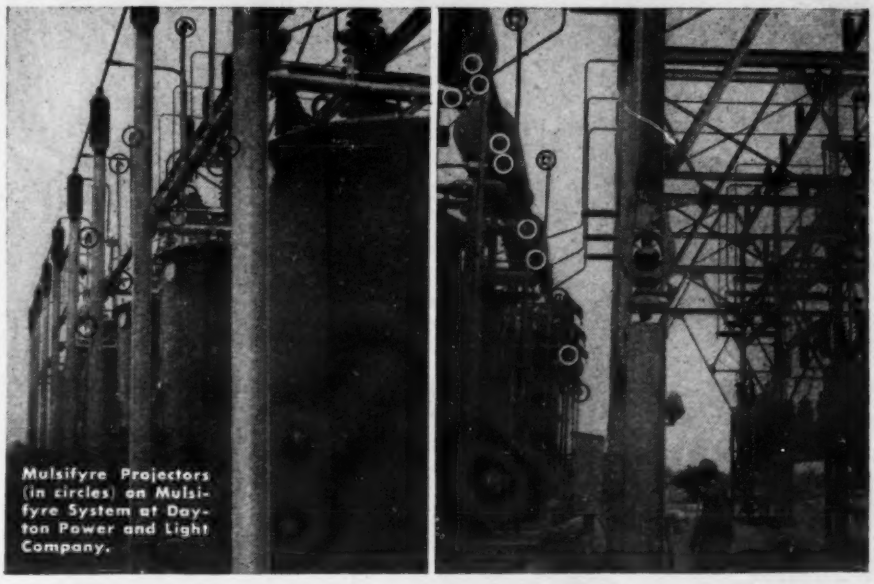
★ **OPERATING FREQUENCIES** . . .
up to 40 megacycles.

★ **POWER FACTOR** . . . .
.004 to .006 at 1,000 cycles.

TOBE DEUTSCHMANN CORP. TOBE CANTON · MASSACHUSETTS

A SMALL PART IN VICTORY TODAY — A BIG PART IN INDUSTRY TOMORROW

NO SERVICE INTERRUPTION
after bad transformer flare-up



Mulsifyre Projectors (in circles) on Mulsifyre System at Dayton Power and Light Company.

GRINNELL MULSIFYRE SYSTEM
averts disaster by immediate action

"PRACTICALLY NO DAMAGE FROM FIRE", was the report of The Dayton Power & Light Co. on a serious flare-up that resulted from an electrical failure on one of their substation step-up transformers. 35 FOOT FLAMES were extinguished so quickly by the Mulsifyre System that adjacent transformers were unaffected. THIS IMMEDIATE, DEPENDABLE ACTION is the reason why leading utilities have chosen Grinnell Mulsifyre Systems for protecting over 10,000,000 KVA of transformer capacity, and many other installations of similar oil-filled equipment.

MULSIFYRE SYSTEMS operate on the principle of emulsifying blazing oil with a driving spray of water. The oil is turned into a liquid which is incapable of burning. Fire is extinguished in a few seconds and reignition is prevented.

Complete separation of water and oil takes place in a few hours . . . leaves oil undamaged.

There is absolutely no conductivity along the discharge of a Mulsifyre projector when spray strikes conductors carrying high voltages.

Mulsifyre Systems are permanently installed . . . they operate automatically or manually.

Recommended by Underwriters' Laboratories for use in extinguishing fires in flammable oils immiscible with water, wherever such oil is a fire hazard – in transformers and other oil-filled electrical equipment.

See that your equipment has this 24-hour-a-day protection, before fire strikes. Experienced Grinnell engineers will help you plan protection for your specific needs.

GRINNELL COMPANY

Executive Offices, Providence 1, R. I.
Branch offices in principal cities.

GRINNELL *Mulsifyre*

AUTOMATIC FIRE PROTECTION

for a considerable period. Ellsworth Newbury of the Connecticut Valley Power Exchange staff, Hartford, has resigned to engage in sales engineering work with the Hamilton Standard Propeller Co., East Hartford.

•

Rockbestos Assigns New Duties to H. O. Anderson

H. O. Anderson, formerly general sales manager of the Rockbestos Products Corp., New Haven, Conn., has been

H. O. Anderson

elected vice-president of that organization in charge of sales.

A native of Worcester, Mass., Mr. Anderson became identified with Rockbestos in 1927 following previous association with the wire and cable industry.

•

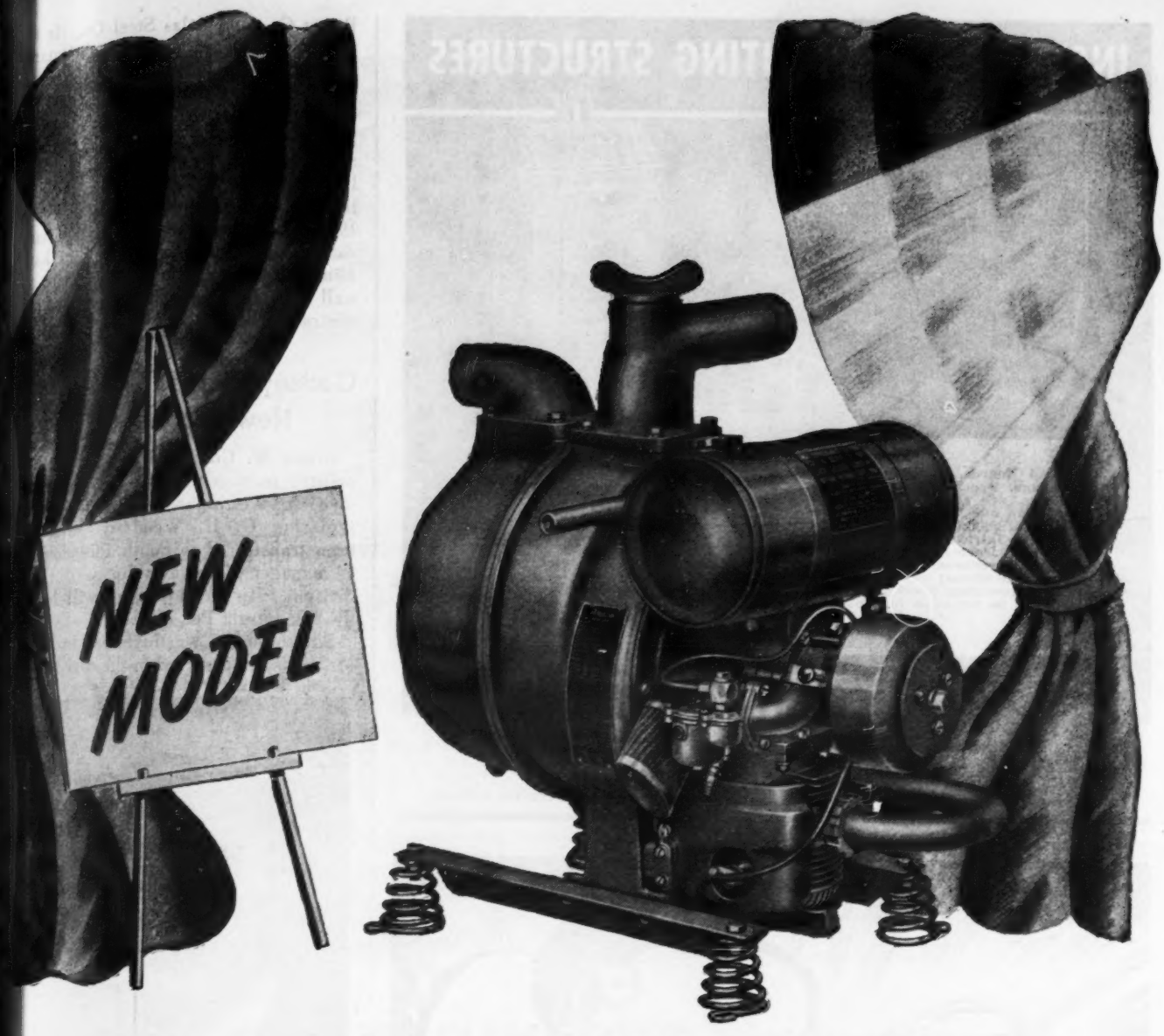
National Pole Elects D. D. Davis President

At the recent meeting of the board of directors of the National Pole & Treating Co., R. H. M. Robinson, president for the past 14 years, was elected chairman of the board, and Donald D. Davis was named president to succeed him. G. H. Ramsey was elected vice-president and general manager.

Other officers elected included: R. A. Halgren, R. W. Andrews and C. T. McMurray, vice-presidents, and R. D. Main, secretary-treasurer.

•

► HARRY B. ZIMMERMAN, assistant vice-president of Buffalo, Niagara & Eastern Power Corp., and power consultant to the corporation's western division companies, has retired, after an association with the electric utility business that dates back to 1906. Starting with Niagara, Lockport & Ontario Power Co., he made subsequent connections with Grays Harbor Railway & Light Co., Aberdeen, Wash., Niagara and Erie



NOW you can get a NEW Homelite Portable Pump

The new Model HR Homelite Self-priming Pumps are now coming off our production line.

However, only a few are being built . . . a limited quantity each month for essential civilian use. Your priority rating is your "ration coupon."

True to Homelite standards, these gasoline-engine-driven self-priming pumps are easily portable and extremely rugged. They have a large capacity . . . 28 foot suction lift . . . keep seepage at strainer level . . . and are non-clogging, foolproof and weatherproof. A new engine design gives increased power . . . with a reduction in weight.

These new Homelite Pumps can be furnished with fittings for 2″ or 3″ hose . . . and the two size fittings are interchangeable.

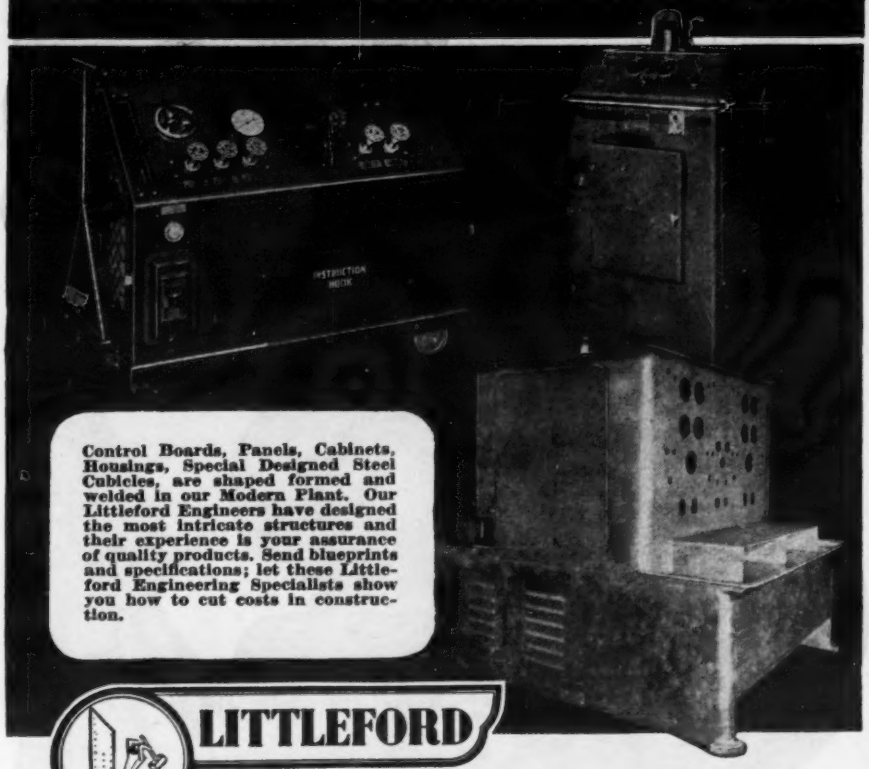
Write today for complete information and prices on these new Model HR Homelite Portable Pumps. Don't forget to give us your priority rating.

HOMELITE CORPORATION

PORT CHESTER, NEW YORK

***PORTABLE* PUMPS • GENERATORS • BLOWERS**

INSTRUMENT MOUNTING STRUCTURES



Control Boards, Panels, Cabinets, Housings, Special Designed Steel Cubicles, are shaped formed and welded in our Modern Plant. Our Littleford Engineers have designed the most intricate structures and their experience is your assurance of quality products. Send blueprints and specifications; let these Littleford Engineering Specialists show you how to cut costs in construction.

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VICTOR INSULATORS INC
VICTOR, NEW YORK
V
The Mark of Good Insulators...

Power Co., and Atlas Steel Co. He returned to Niagara, Lockport & Ontario in 1922, but in 1931 was transferred to Buffalo as assistant vice-president of Buffalo, Niagara & Eastern Power Corp. in charge of power sales. Later he had added to his duties the direction of the lighting bureau, heating and air conditioning and rural electrification. Since 1937 Mr. Zimmerman has been assistant vice-president, as power consultant, handling special large power contracts, as well as serving as advisor on municipal contracts.

•

Godsey Named Manager, New Products Division

Frank W. Godsey, Jr., has been appointed manager of the new products division, Westinghouse Electric Corp., replacing G. H. Woodard, who has been transferred to South Philadelphia as manager of the aviation gas turbine division. His headquarters will be at the Pittsburgh, Pa., office.

Since joining Westinghouse in 1940, Mr. Godsey has served in the division he

F. W. Godsey, Jr.

now directs. Previously he was development engineer with the Safety Car Heating & Lighting Co., New Haven, Conn., and more recently chief electrical engineer and assistant production manager for the Sprague Electric Co., North Adams, Mass.

Mr. Godsey has to his credit patents on some 40 electrical and mechanical devices and has written numerous technical papers for the American Institute of Electrical Engineers, of which he is a member, and for the Electrochemical Society.

•

▶ HAROLD F. FINNEMORE, assistant chief electrical engineer, Canadian National Railways, has been appointed chief electrical engineer to succeed R. G. GAGE, retired. Mr. Finnemore became associated with Canadian National Railways in

Why FREIGHT ELEVATORS are Important!

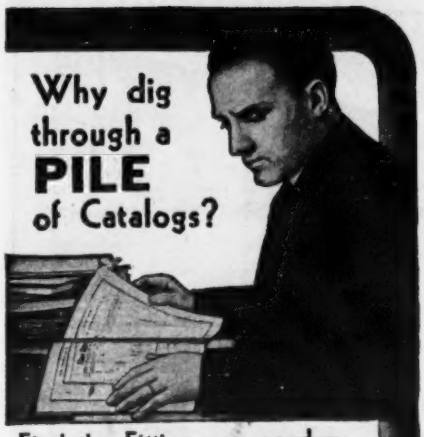
BEHIND this busy scene, freight elevators are constantly on the job . . . keeping supplies and even the trucks themselves moving on schedule . . . without bottlenecks . . . without confusion.

For intensive service, the elevators should be high speed, automatic in operation and provided with power operated doors. Such equipment will compensate for some of the time lost in loading and unloading operations.

If conditions require, freight elevators can be dispatched to predetermined floors to suit any cycle of operation. Also, they do not necessarily require regular attendants.

Your nearest Otis representative is now available to assist you and your Architect in making preliminary elevator plans and studies. For the finest in vertical transportation tomorrow, call your Otis representative TODAY!

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES



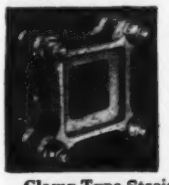
Why dig through a **PILE** of Catalogs?

Find the Fitting you need—quickly—in the COMPLETE line

If you have a Penn-Union Catalog, you can instantly find practically every good type of conductor fitting. These few can only suggest the variety:

Universal Clamps to take a large range of conductor sizes; with 1, 2, 3, 4 or more bolts.

L-M Elbows, with compression units giving a dependable grip on both conductors. Also Straight Connectors and Tees with same contact units.

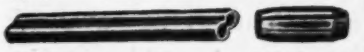


Bus Bar Clamps for installation without drilling bus. Single and multiple. Also bus supports — various types.

Clamp Type Straight Connectors and Reducers, Elbows, Tees, Terminals, Stud Connectors, etc.

Jack-Knife connectors for simple and easy disconnection of motor leads, etc. Spring action — self locking.

Vi-Tite Terminals for quick installation and easy taping. Also sleeve type terminals, screw type, shrink fit, etc. etc.



Splicing Sleeves, Figure 8 and Oval, seamless tubing—also split tinned sleeves. High conductivity copper; close dimensions.

Preferred by utilities, industrials, electrical manufacturers, contractors — because *they have found that "Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

1923. During his 31 years of service with CNR, Mr. Gage has been identified with many important electrical developments, including diesel-electric locomotives and the installation of the electrification system for the Montreal Terminal Development.

•

Engineering Appointments Announced by Biddle Co.

Announcement has been made by James G. Biddle Co., Philadelphia, of the appointment of J. Robert James to the position of vice-president and treasurer and of Edward H. Wannemacher as general manager.

Mr. James joined the Biddle organization in 1930, having been in a responsible position in the factory of J. E. Rhoads & Sons for several years previously. In 1935 he was made secretary-treasurer of the James G. Biddle Co. when the company was incorporated at that time. In his new executive position he will be in charge of financial and legal matters. Mr. James is active in the Scientific Apparatus Makers of America.

Mr. Wannemacher became identified with the Biddle company in 1911, and enjoys the distinction of having risen from office boy to general manager. He is also secretary of the company. For some years he has had charge of customer relations, and during the past three years has been executive head of the company's new manufacturing project.

•

New Appointments Made by General Electric Co.

Among the recent assignments made by the General Electric Co. are the following:

Dudley E. Chambers has been appointed executive engineer of the research laboratory, succeeding Dr. Laurence A. Hawkins, who has held the position since it was created in 1912 and is now retiring. Mr. Chambers was first employed in the research laboratory when he joined G. E. in 1928. Subsequently he served in the industrial control division and the transmitter engineering division, returning to the research laboratory in 1944. Mr. Hawkins became identified with the research laboratory in 1912, first as engineering assistant to the director, then as executive engineer. In this position he has acted as business manager of the laboratory and co-ordinator of the varied research activities of the several hundred scientists employed.

Four new appointments in the trans-

It's YOUR future— Make the most of it!

Start now to earn the bigger pay in electrical repair

Was there ever such an opportunity to get started in electrical maintenance and repair—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick! practical!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can too!

Electrical Maintenance and Repair Library

5 volumes, 2042 pages, 1721 illustrations

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores, DC and AC windings—to test armature windings, test induction motors, etc., etc. The new book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Includes trouble-shooting book

Now in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanations of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupons today.

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Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $3.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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Firm or Employer .....
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THE KELLETT XR-8 HELICOPTER

Just released by the Army Air Forces, this photograph illustrates a new product whose evolution toward important peace-time achievements has been stimulated by the urgency of war.

The XR-8 is the first American helicopter successfully tested in flight to embody the principle of an *intermeshing twin set* of rotor blades. Structural vibration, long an obstacle to progress in rotary-winged craft, is largely removed. Many related problems have been solved. The need for long power-transmission shafts is eliminated. Weight and drag are saved, increasing pay-load.

Its whirling "egg-beater" vanes enable the XR-8 to fly forward, backward or sidewise with unusual efficiency. Like a hummingbird, it can hover motionless in the sky, or only a few feet above ground. Its vertical take-off and descent permit operation to or from any space that gives safe clearance to the sweep of its own blades.

With sixteen years of design and engineering experience in autogiro and helicopter development, the Kellett organization believes that helicopters will perform a wide range of useful jobs in the new air world of tomorrow.

"Answering Some Helicopter Questions" gives interesting facts about "wingless flight." For free copy, write to Kellett Aircraft Corporation, Dept. E, Upper Darby (Philadelphia), Pa.

KELLETT

OLDEST ROTARY WING AIRCRAFT MANUFACTURING COMPANY

AN EASIER WAY TO MEASURE GROUND RESISTANCE!

Resistance to earth of man-made grounds made easier, accurately. For service in Light and Power fields—Railroad Signal Equipment—Telegraph and Signal installations—Radio Broadcasting—Public Utility and R.E.A. Projects. Also—wherever explosives are made.

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VIBROGROUND

Does a thorough job protecting life and property under any operating condition. Self contained power supply—long lasting batteries. NO HAND CRANKING. Has push button control and direct reading. Design excludes all "strays." Welded one piece water-tight case. 2 models: 251 triple range for general conditions; 255 four ranges, for extremely low and high values sometimes encountered.

Send for Bulletins with full engineering detail.

Also literature on Vibrotests, Insulation Resistance Testers, Hypot, Insulation Breakdown Testers. Full line of electrical testing units. Engineering Service Representatives in all Principal Cities.

Model 255 Vibroground

221-C SOUTH GREEN ST. — ASSOCIATED RESEARCH, Incorporated — CHICAGO 7, ILLINOIS

Royal-ettes

#14 in a series of informative letters from a producer of Power Switching Equipment

DESIGNED TO PLEASE A USER

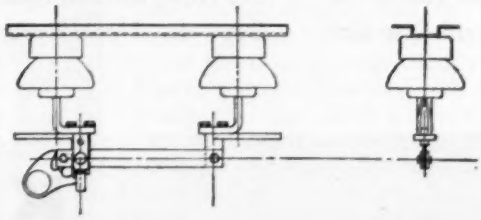
Late in 1942 Howard Stites, Electrical Engineer of the Central Illinois Public Service Company asked us to bring out a switch for distribution service. At his request we combined:

1. The proven reliability of our light duty type B switch.
2. The insulation level and design used duty type 35 cutout.
3. A new design of one-piece, formed-steel base providing side angles for mounting with bolt holes spaced to permit clamp mounting on single arms, or bolt mountings on doubel arms.

The result, our type BBS switch, illustrates the close degree of manufacturer-customer cooperation practiced at Royal.

The type BBS switch will carry 400 amps. and has an insulation level suitable for 7500 v./12500 v.Y. For double-arm mounting, the bolt-hole arrangement accommodates any arm drilling. The price range permits its use on any distribution circuit.

This switch is not yet catalog listed, so let us have your inquiries.



ROYAL ELECTRIC MFG. CO. 619 E. 40th Street CHICAGO 15, ILL.

former division, central stations divisions included H. M. Jalonack as assistant to manager, transformer division. He is succeeded as manager sales, distribution transformer section by C. E. Burke of Fort Wayne, Ind., formerly assistant manager sales, specialty transformer section. D. F. Roloff has been appointed assistant manager sales, succeeding Mr. Burke, and E. V. Dillon, formerly assistant manager sales of regulators, has been appointed manager sales, feeder voltage regulator section.

Two appointments in the company's industrial divisions name J. J. Huether assistant manager of the industrial divisions, and W. A. Wirene manager of the industrial materials division. Mr. Huether had been manager of the industrial materials division for eight years, with Mr. Wirene as assistant manager since 1942.

Pacific Coast assignments included the selection of Arthur D. Bragg to succeed Allen G. Jones as Pacific District Manager, central station-transportation department and the appointment of G. F. Maughmer as assistant manager of the Los Angeles office. Prior to his recent promotion, Mr. Bragg was assistant to the manager of the Los Angeles office. Mr. Jones, his predecessor, recently was promoted to manager of apparatus in the Pacific District. Mr. Maughmer was formerly in San Francisco.

Carl A. Salmonsen, assistant manager of the River Works at Lynn, Mass., has been named manager of the Philadelphia Works and Robert Paxton, Philadelphia Works manager, has been named manager of the Pittsfield (Mass.) Works, effective July 1, at which time L. E. Underwood will retire as manager there. Mr. Paxton, until July 1, will be assistant manager of the Pittsfield Works.

Elizabeth Woody has been appointed director of the General Electric Consumers Institute. Miss Woody was director of foods for McCall's Magazine from 1935 to 1944.

•

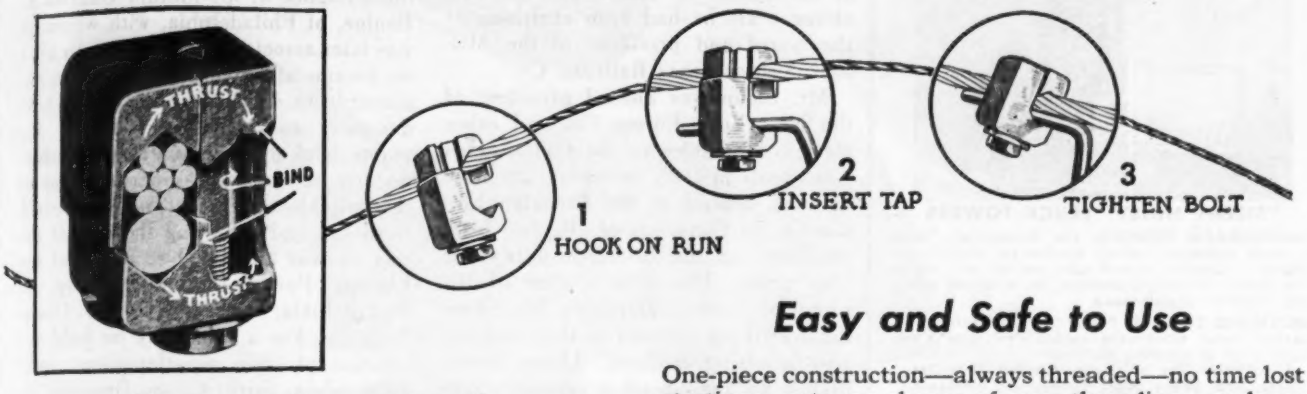
► LT. COL. ROLLIN S. ARMSTRONG has returned to his duties as Natchez district manager for the Mississippi Power & Light Co. after nearly five years of service in the U. S. Army. D. D. ARCENEAUX, who has served as district manager in Colonel Armstrong's absence, will resume his former duties as superintendent of operations at Natchez.

► DR. ZAY JEFFRIES, vice-president of the General Electric Co., has been awarded the Clamer Medal by the Franklin Institute for "meritorious contributions to the science of metals."

FARGO One-Piece Connectors

Easy to Use . . Grip Like a Vise

Save man hours . . . reduce service interruptions



"Grips Like a Vise"

High pressure at wire contact point develops terrific *vibration-proof bind* from inside thrust.

The bolt is forged and rolled for extra strength, with precise, rolled threads, which makes for easy turning and high compression without stripping.

The mechanical construction of Fargo Connectors, plus the carefully selected copper alloys used (massive bodies 96% copper; high strength bolts 98% copper), insure high conductivity and dependability. They may be used over and over again.

Easy and Safe to Use

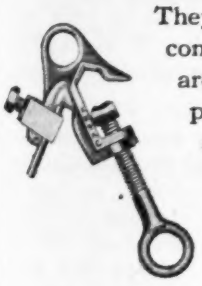
One-piece construction—always threaded—no time lost starting a nut—no chance of cross threading—no loose parts to lose.

Safer to use. Bolt tightens with short, easy twist of the wrist; no arm or shoulder swing needed.

Three sizes of bolt heads—any adjustable wrench will fit 12 sizes of Fargo Connectors handling wires from No. 8 Solid to 6/0 Strand.

For full details of complete Fargo line see listing in current Electrical Buyers Reference.

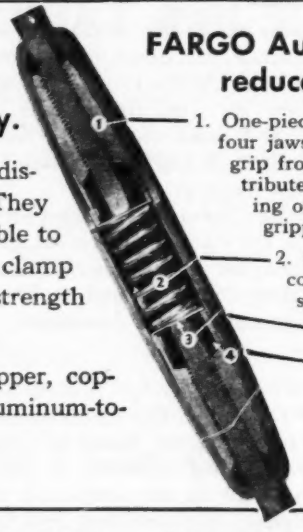
FARGO Hot Line Clamp gives maximum strength, clamping pressure and current carrying capacity.



They are used wherever easy disconnection may be desirable. They are well balanced and adaptable to practically all makes of clamp sticks. Made of 93% high strength copper alloy.

3 sizes, for copper-to-copper, copper-to-aluminum, or aluminum-to-aluminum.

FARGO Automatic Line Splice holds fast—reduces work hazards—saves time.



1. One-piece jaw assembly keeps teeth in alignment. The four jaws adjust better to the contour of the conductor; grip from end of wire outward so pulling strain is distributed all along the wire. Uniform height and spacing of teeth assure maximum conductivity and sure gripping.
2. Spring exerts ample pressure to prevent the conductor from working out of the jaw when the splice is not under tension.
3. Stop plate.
4. Safety zone accommodates burred and upset wire ends.

Fargo Automatic Line Splices are made to handle wire sizes from 6 Solid to 4/0 Strand. Every Fargo Splice is hand tested before it leaves the factory!

Full Fargo line of Vise-type Connectors, Automatic Line Splices, Hot Line Taps and Sticks, Multiple Taps, Dead Ends, Compression Cone Connectors, Sleeves, Ground Clamps, and other Electrical Specialties are distributed by

LINE MATERIAL COMPANY · MILWAUKEE · WIS.

Representatives in principal cities

FARGO MFG. COMPANY EST. 1914 POUGHKEEPSIE, N.Y.

PIONEER MFRS. OF
Truck Winch & Crane Equipment
FOR PUBLIC UTILITIES
1918-1945—OUR 27TH YEAR

"SILENT HOIST" TRUCK TOWERS

PANTOGRAPH TOWERS: The Pantograph Tower is power operated, entirely mechanical, utilizing no cables, no sheaves, no hydraulic devices, etc., which are subject to wear. It provides for maximum safety and minimum maintenance.

SECTIONAL TOWERS: Power Operated Telescopic-Section Tower. Electrically welded steel, 2 or 3 sections, plain or rotating platform.

A complete line of Power Winches, Pole Derricks, and Swing Boom Cranes are available. Write for Catalog No. 60.

TYPICAL USERS: AT&T; N. Y. Tel. Co.; T. V. A.; Virginia P. S. Co.; Consolidated Edison Co.; etc.

Agents in Principal Cities

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SILENT HOIST & CRANE CO.
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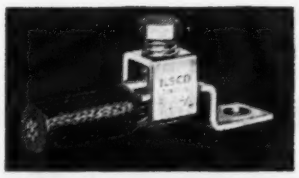
ELECTRICAL CONNECTORS

WHAT WE SAVE IN WEIGHT
YOU SAVE IN COSTS

Most value per dollar . . . most service and satisfaction. Figure it out . . . you're way ahead because ILSCO PRODUCTS are

12% cooler
50% lighter
75% lower price
99% pure electrolytic copper
100% conductivity



Write for 32-page illustrated catalog.

ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

OBITUARY

Matthew S. Sloan

Matthew S. Sloan, who until his resignation as president of the New York Edison Co. and affiliated companies in 1932, had been an outstanding figure in the utility field in New York City, died on June 14 in New York Hospital at the age of 63 years. For the past eleven years he had been chairman of the board and president of the Missouri-Kansas-Texas Railroad Co.

Mr. Sloan was elected president of the New York Edison Co. and other electric companies in the Consolidated Gas group in 1928, following purchase of stock control of the Brooklyn Edison Co. by Consolidated. He had been president of the Brooklyn utility for nine years. Placed in charge of the group of electric companies, Mr. Sloan made striking changes in their policies and operating methods. Almost immediately he announced a voluntary rate reduction estimated at $4,500,000 a year. Engineering policies were reorganized to promote efficiency and economy. He stopped extension of the direct current distribution system of the New York Edison Co., with its heavy investment costs and extended alternating current service, as he had done in Brooklyn. Also company practices in accounting, purchasing, sales and advertising were reorganized and standardized.

A native of Mobile, Ala., and a graduate of the Alabama Polytechnic Institute, Mr. Sloan first worked for the General Electric Co. in Schenectady and then for the Birmingham Railway, Light & Power Co. and the New Orleans Railway & Light Co. before coming to New York.

Mr. Sloan was a past-president of the old National Electric Light Association, the Association of Edison Illuminating Companies and the Empire State Gas and Electric Association.

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▶ ERNEST W. HOLMES, a member of the Electric Power Board of Chattanooga, Tenn., died suddenly in that city on June 10 in his sixty-third year. Mr. Holmes was president and founder of the Ernest Holmes Co.

▶ FRANK SILLIMAN, JR., retired vice-president of the Electric Bond & Share Co. and a former executive of several other utilities, died on June 13 at his home in Bass River, Mass., at the age of 81. Mr. Silliman retired eight years ago. Born in Ashtabula, he had been vice-president of the American Power & Light Co. and the Spokane Railroad Co.; president and director of the Montana Gas Co. and a vice-president and director of the Washington Water Power Co.

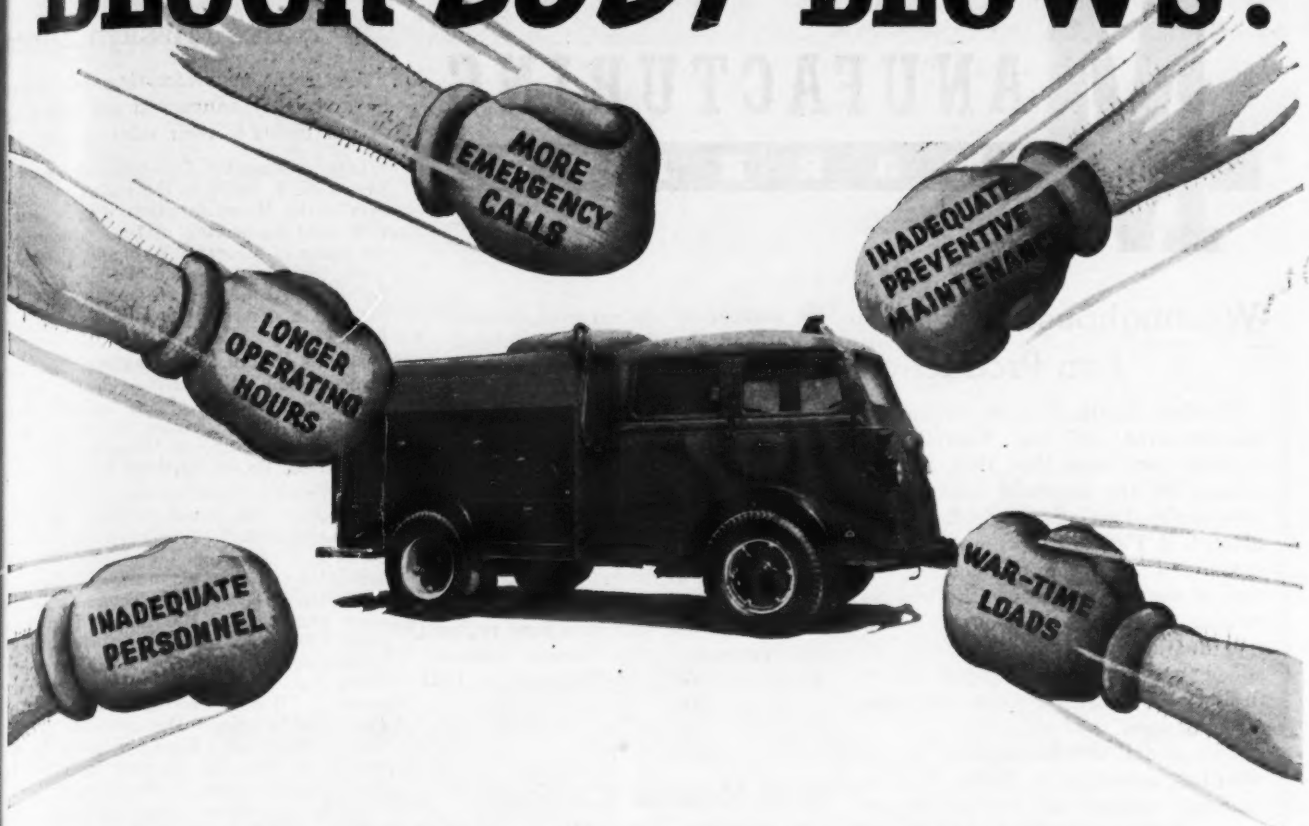
▶ J. HARVEY BONINE, one of the organizers of the Bra Bon Electric Co., manufacturers' agents of Philadelphia, Pa., died on May 12 as the result of a motor accident. Mr. Bonine was born in Lancaster, Pa., 47 years ago. He received his engineering education under the guidance of his brother Charles E. Bonine, of Philadelphia, with whom he was later associated in business. In 1914 he became affiliated as construction engineer with Lewis & Roth Co., which designed and built sub-stations for plants making war materials. Subsequently he was made superintendent of the switchboard department of Lewis & Roth Co. and following the end of the war, he was appointed secretary of the Electric Power Equipment Corp. of Philadelphia, successor to the Lewis-Roth Co. For a few years he held the position of shop superintendent, until 1930 when, with C. S. Brangan he formed the Bra Bon Electric Co. Mr. Bonine had become well known in electrical circles through his many years of sales activity in local and other sections of the United States.

▶ CLAUDE J. HOLSLAG, president of the Electric Arc Cutting & Welding Co., Newark, died in that city on June 11 at the age of 60. Mr. Holslag won in 1939 the award of the Samuel Wylie Miller Medal from the National Metals Congress for long and outstanding achievements in welding research. He held several patents for electric welding methods and devices. A graduate of Columbia University, Mr. Holslag was with the New York Central Railroad before becoming one of the founders of the Newark organization in 1918. Mr. Holslag was a fellow of the A.I.E.E. and a member of the American Welding Society.

▶ HOMER RIDDELL, field engineer for the BullDog Electric Products Co., Detroit, Mich., died suddenly on June 5 of a heart attack at his home in Indianapolis. He was 42 years of age. Born in Fairfield, Ill., Mr. Riddell had been associated with the electrical industry since the time he left school—first as a wholesaler's and later as a manufacturer's representative. He joined BullDog's staff in 1934 and shortly after was appointed district manager for the Indianapolis territory, the position he held at the time of his death.

▶ ADELBERT S. JAQUITH, 74, who was employed by General Electric Co. in Lynn, Mass., in its pioneer days, and who later practiced as an industrial engineer in Chicago, St. Louis and Point Marion, Pa., died suddenly at Lynn on June 10.

BLOCK *BODY* BLOWS!



Strength and Stamina of YORK-HOOVER BODIES Save TIME, MONEY and MANPOWER

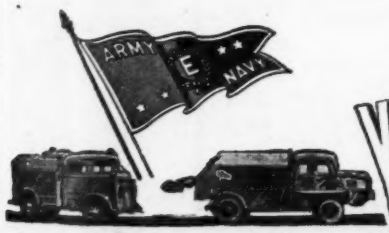
The inherent strength and stamina of York-Hoover Public Utility Bodies combat excessive body blows on both the war and home fronts.

Whether it be a small service unit for emergency repair, a ladder job for overhead work, or a heavy duty line construction body with complete equipment, the same sturdy construction facilitates better body service—way beyond the normal depreciation period.

Since the advent of the motor truck, York-Hoover engineers—men skilled in the art of solving body problems—have designed and built thousands of bodies that provide constant, trouble-free operation.

This accumulated "know-how" is a sound reason why York-Hoover is qualified to solve your problem and give you better body service . . .

Be "Body-Wise"! Consult York-Hoover



BODY DIVISION

YORK-HOOVER CORPORATION

YORK, PENNSYLVANIA

MANUFACTURING MARKETS

Westinghouse Starts Fan Production

The first electric fans for civilian use manufactured by the Westinghouse Electric Corp. since May, 1942, are now coming off the assembly lines of the company's East Springfield, Mass., plant, J. R. Weaver, works manager, has announced. Current production is a part of the fan program authorized for civilian purposes by the War Production Board, Mr. Weaver declared, but added that civilian sale is restricted entirely to hospitals, war plants and other essential uses.

Two models are being made by the company, according to Walter B. Massenburg, manager of the fan department. Both are oscillating fans for desk or bracket use, and both are the same design as were made before the war. Of the total number of fans assigned to Westinghouse for production to date, 16,000 are the 16-inch size, and 4,900 are 12-inch models.

•

Western Auto Announces Post-War Program

Heavier concentration in electrical home appliances is indicated in a statement of post-war plans of Western Auto Supply Co., Kansas City, Mo., just released by Lester Hutchings, president.

Heretofore, the company has been a rather large factor in radio and auto radio sales, and has conducted operations in refrigerator, washing machine and other heavy appliance lines. It will now widen its line of such appliances which will be carried in about double the number of pre-war company-owned stores and about treble the number of retail outlets known as Western Auto associate stores.

Included in the expansion program are plans for increasing substantially the company employees. Western Auto not only will need and welcome the return of almost 2,000 employees now in the armed forces, but also will require the services of added thousands, Mr. Hutchings said.

Although war scarcities have reduced the company sales volume recently, Western Auto hit a sales peak in 1941 of $71,042,621.

•

New Metallic Coatings Announced by Hommel Co.

Special metallic coatings which can be used for conductive purposes and as a base for soldering has been developed by the O. Hommel Co., Pittsburgh. The coatings are adaptable to a glass surface as well as a glazed or unglazed ceramic body. A special product for use on mica in condenser work has also been developed. The material can be prepared for spraying, hand painting, printing through a silk screen and dipping.

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently announced the following appointments to their sales staffs:

LINE MATERIAL CO., Milwaukee, has named W. F. Smith to the position of manager of the Mountain States district of the L-M field-engineering division, comprising the states of Montana, Wyoming, Colorado, Utah, Idaho, Oregon and Washington. Mr. Smith joined the L-M organization in 1939. Mr. Smith makes his headquarters in Salt Lake City.

NATIONAL POLE & TREATING CO., has named Frank M. Anderson district representative in charge of its Chicago office. Recently discharged from the Armed Services, Mr. Anderson was formerly with Public Service Co. of Northern Illinois.

ILG ELECTRIC VENTILATING CO., Chicago, in keeping with extensive plans for post-war expansion, has opened new branch offices in Grand Rapids and Knoxville and appointed new sales engineers in Dallas and Philadelphia. The newly appointed Dallas sales engineer is Marvin Gardner, who since 1939 has been associated with the heating and ventilating industry. George A. Innes has been appointed sales engineer under C. Warner Smith, manager of the Philadelphia office. The new Ilg branch office in Knoxville, Tenn., is under the direction of Roy H. Mackay and that in Grand Rapids under J. W. Pulte.

W. N. MATTHEWS CORP., St. Louis, Mo., has appointed B. H. McCoin, Post Office Box 254, Knoxville, Tenn., as sales engineering representative in the state of Tennessee. Mr. McCoin was formerly superintendent of power operations for the Knoxville Power and Water Board.

•

Holophane Dividend

A dividend of 40 cents a share was voted on the common stock of the Holophane Co., payable June 20. This is 5 cents more than the last distribution on March 15.

SCHRAMM EXPANDS—As a part of its modernization program Schramm, Inc., manufacturers of portable and stationary air compressors, has added a new entrance building at its West Chester, Pa., plant. The plate glass windows are two of the largest ever installed in that district. A new machine shop has also been added, and plans have been made for bringing up to date the older building shown in the background

Continental-Diamond

Engineered Dielectric Materials

The part illustrated is a machined Dilecto XX Insulation Terminal Block. It is used in circuit controllers in railway signal equipment. It mounts current carrying parts and must be strong as well as being a Dielectric.

KP-45

On the modern Railroad, with its high speed comfort and safety, signal systems must function without fail. The role which C-D Dielectric materials play in insulating Railroad Signal Systems demonstrates their remarkable combination of properties. Resiliency . . . toughness . . . long life . . . adaptability to fabrication . . . electrical insulating properties . . . combine in C-D Dielectrics to provide engineers and designers with NON-metallic materials that will answer many "What Material?" problems.

C-D PRODUCTS

The Plastics

DILECTO—A Laminated Phenolic.
CELORON—A Molded Phenolic.
DILECTENE—A Pure Resin Plastic Especially Suited to U-H-F Insulation.
HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

The NON-Metallics

DIAMOND Vulcanized FIBRE
VULCOID—Resin Impregnated Vulcanized Fibre.
MICABOND—Built-Up Mica Electrical Insulation.

Standard and Special Forms

Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

Descriptive Literature

Bulletin GF gives Comprehensive Data on all C-D Products. Individual Catalogs are also Available.

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WEST COAST REPRESENTATIVES
MARWOOD LTD., SAN FRANCISCO 3

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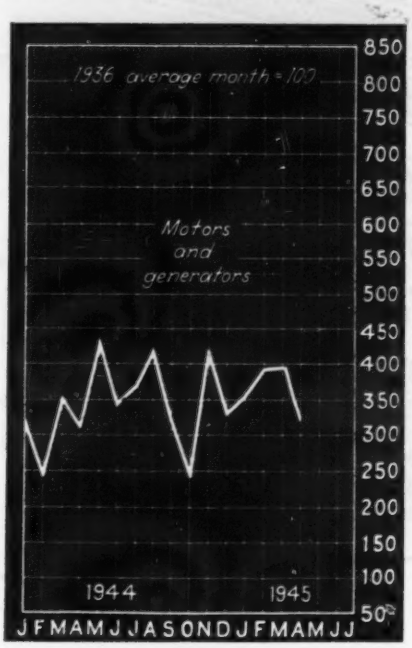
Continental-Diamond FIBRE COMPANY

Established 1895 . . Manufacturers of Laminated Plastics since 1911—NEWARK 15 • DELAWARE

Generator Orders Drop 18 Percent in April

New orders for motors and generators during the month of April dropped from the total recorded for the month of March, according to figures released by the National Electrical Manufacturers Association. The NEMA index decreased 18 percent from 398 in March to 328.4 in April, a drop of 18 percent.



NEMA Index, value of orders received

The April figure, however, represented an increase of 5 percent over that recorded for April, 1944, when the index stood at 311.

The 1944 monthly indexes include an adjustment for cancellations reported up to December 31. No adjustment has been made for renegotiation of contracts.

•

South African Plastics Market Seen Post-War

"South Africa will provide a fertile market for American exports in post-war days with unusual interest developed in such war-developed refinements in laminated plastics for industrial, consumer and decorative applications," A. A. Smit, Johannesburg, Union of South Africa, reports.

Mr. Smit, who is associated with the Lamson International Corp., Johannesburg, which represents the Formica Insulation Co., Cincinnati, termed South Africa "ready and waiting as a wonderful market for American-made products." Lamson sent Mr. Smit to Ohio to study wartime developments of laminated plastic products.

Field Reports on Business

Although war-order cutbacks and cancellations have affected general manufacturing activity, the level of electrical manufacturing is being sustained. Long-deferred improvements in utility systems are now being executed because of the release of WPB restrictions on utility construction.

CHICAGO

Although general manufacturing activity in the Chicago area is on a downward trend, due to war-order cutbacks and cancellations, levels of electrical manufacturing are being sustained and in some instances increased by the release of WPB restrictions on utility construction. Long-deferred improvements in utility systems are being executed and their effect is readily discernible in orders booked by electrical manufacturers in this area.

Most active lines appear to be rural and distribution transformers, wire and transmission cable, insulators, switchgear, pole line hardware and generating station apparatus. Backlog of transformer orders, particularly rural types is large and a shortage of cedar poles is leading some utilities in this area to stock firm and other less popular pole timbers in order to move forward with construction programs.

This week saw the cancellation of the army's $100,000,000 contract with Studebaker Corp., South Bend, Ind., for the production of 2½-ton cargo trucks. Termination, effective July 31, will release 5,000 workers between now and August 1 in this area.

Further indication of the easing of the manpower shortage in this area is seen in the lifting of hiring controls for women by the regional WMC director in Chicago. Women no longer need referral cards from U.S.E.S. Essential employers can issue statements of availability for transfer of women in their employ 60 days or more, and ceilings on total employment have been lifted although those on number of men remain in effect.

NEW ENGLAND

Included in the recommendations for 1946 naval appropriations are replacement to hauling and loading machinery at Boston Navy Yard, estimated to cost $460,000, communications, $50,000 and elevators to cost $100,000. Portsmouth (N.H.) Navy Yard expenditures listed are $865,000 for water service, $600,000 for communications, and $25,000 for elevators. An expansion of facilities at Portland Me. will cost over $200,000 including $25,000 for lighting, and additions to communications at Newport (R.I.) Naval Station are estimated to cost another $50,000.

Boston & Maine R. R. is testing out diesel locomotives rated at 4000 hp; Westinghouse Elec. Corp. is adding to its Springfield (Mass.) plant at a cost of approximately $114,000, and the Holyoke (Mass.) division of Worthington Pump & Machinery Corp. has begun production of air-conditioning units with orders on hand to permit plant operations at full capacity throughout 1945. Building permits reported for sixty-eight Massachusetts municipalities show a sharp gain of 68 percent over last year for the month of May. Installations and changes in small motors in Boston factories are in good number and wiring permits for the current month show a substantial increase over last year.

ASO awards received by New England manufacturers include antenna, Ucinite Co., Newtonville, Mass., $28,250 and conduit, American Brass Co., Waterbury, Conn., $53,178. Connecticut machine bearing manufacturers are filling large navy orders and U. S. Rubber Co., Naugatuck, Conn., has received a pararaft order totaling $1,147,950. American Optical Works, Southbridge, Mass., has booked another large optical goods order amounting to $150,000.

Bidding on Navy supply schedules is less active. Bids were tendered last week to furnish fuses, terminals, and bituminized fiber conduit in moderate sized lots. Small motors are selling well. Lighting materials are in active demand.

NEW YORK

For the second successive week, investment banking in this area was virtually at a standstill last week, activities being centered in the War Loan drive and in making plans for the large bond issues which are scheduled for offering next month.

Civil engineering construction volume totaled $59,216,000 last week, the highest weekly total reported to *Engineering News-Record* since August 31, 1944. The week's total topped the preceding week by 38 percent and was 102 percent above the corresponding 1944 week. Public construction for the week was the second highest reported in 1945 and private construction recorded its third highest 1945 weekly total. The week's volume brought 1945 construction to $787,742,000 for the 24 weeks, a 5 percent decrease from the $829,378,000 reported for the period in 1944.

An estimated increase of 25 percent over last year's sales volume by department stores in the Metropolitan area was accounted for by heavy buying of seasonal merchandise.

PACIFIC COAST

Pacific Coast electrical business is holding up well as compared with last year, being probably within 15 percent of 1944's midyear average. Subcontracting for government work has, of course, dropped appreciably despite many large expansions of existing navy installations as at Hunters Point and Stockton and several new major jobs, such as the proposed Signal Corps depot at Sacramento. But large supply orders for various purchasing departments, such as the Marines, Engineers, and Navy, and especially the steady increase in lighting, school, rural extension and other civilian work through easier restrictions and urgent need is restoring the balance and maintaining volume.

Bonneville System is buying 15 kv. circuit breakers for installation in Albany and Toledo, Ore.; Shoemaker naval hospital has installed a standby power equipment; and Oakland naval supply depot has remodeled its electrical distribution system.

Another major project is a $5,000,000 privately financed hospital and medical school near Beverly Hills, Calif., to cost $5,000,000. Schools, costing $1,350,000 in all are being built in Denver and Pueblo, Colo.

Anna Clegern, Supt. of Nurses, Jackson, Miss.
Turner A. Farrow, Farmer, Oshkosh, Wisconsin
C. B. Dowdey, Elevator Mech., Birmingham, Ala.
Eva Lalonde, Housewife, New Orleans, La.
C. S. McDonald, Police Officer, Alexandria, Va.
I. G. Bay, Dentist, Madisonville, Kentucky
Raymond F. Porch, Painter, Pittsburgh, Penna.
F. F. Smythe, Tool Crib Foreman, Wichita, Kans.
Ruth Dowell, School Teacher, McKinney, Texas
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Do these folks look like tycoons?
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Banks and insurance companies invest your money chiefly in bonds. They put a lot of it into light and power bonds because these companies have proved their soundness for many years.
So the electric industry is probably the most widely owned industry in America. You and almost every other adult American are partners in it. And whatever helps the industry helps you.
* Hear NELSON EDDY in "THE ELECTRIC HOUR," with Robert Armbruster's Orchestra. NOW every Sunday afternoon, 4:30, EWT, CBS Network.
167 ELECTRIC LIGHT AND POWER COMPANIES*
SELF-SUPPORTING, TAX-PAYING BUSINESSES
* Names on request from this magazine.

LOOK over the faces in the advertisement above. Typical, hard-working Americans. They represent several million similar stockholders in America's *business*-managed electric light and power companies.

They give eloquent answer to the worn-out wheeze that all such companies are owned by a few rich men!

Readers of national magazines will see this advertisement during June. It is another in the cooperative series reporting the record—past and present—of America's *tax-paying, self-supporting* electric companies.

Other advertisements appear regularly in farm publications and newspapers. And back of all this is the popular radio program—"The Electric Hour," featuring Nelson Eddy—every Sunday afternoon (4:30, EWT) over CBS.

Be sure to listen to "The Electric Hour" regularly. Watch for the advertisements as they appear. Discuss them with your friends. Remember, this whole program is designed to do a job for *your industry—your company—and YOU.*

167 ELECTRIC LIGHT AND POWER COMPANIES*

SELF-SUPPORTING, TAX-PAYING BUSINESSES

** Names on request from this magazine.*

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Sales Opportunities

NORTH CAROLINA—Duke Power Co., Charlotte, plans extensions in rural electric system in different parts of territory, including close to 1,000 miles of primary and secondary lines, with power substation units, service connections and other operating facilities. Surveys and plans are under way for a number of initial lines, with work to begin as soon as permission is secured from WPB. Company also plans a post-war expansion program in certain generating stations, main transmission and distribution lines, and power substations. Estimates of cost are being made.

MINNESOTA—Water and Light Department, Benson, will receive bids until 8:30 p.m., July 2, for coal-handling equipment for municipal power plant. Pfeifer & Schultz, Wesley Temple Bldg., Minneapolis, are consulting engineers.

NEW MEXICO—War Department, Washington, D. C., has approved plans for expansion in Army Airfield, including additional buildings, with electrical and mechanical equipment. Also installation of new apron floodlights and other lighting facilities. Entire project is estimated to cost about $950,000, and will be carried out under direction of U. S. District Engineers Office, Albuquerque.

NEW YORK—Bethlehem Steel Co., Lackawanna Plant, 1915 Hamburg Turnpike, Lackawanna, Buffalo, has plans maturing for new bar mill for large increased output, comprising a main one-story structure and auxiliary units, to cost approximately $20,000,000, with machinery and electrical equipment. Project will be carried out as a post-war development, with foundations to be laid at present time and superstructure erected later. Power plant at mill will be enlarged for increased power supply. Main offices are at Bethlehem, Pa.

INDIANA—Board of Waterworks Trustees, Evansville, plans expansion and improvements in power facilities at main waterworks station as a post-war project, including installation of new generating unit, boilers, motor-driven pumping machinery, controls and auxiliary equipment. Station will be completely modernized. Estimates of cost are being made and engineer will be selected, it is said, at early date. E. C. Henning is president of board.

IOWA—Light and Power Department, Hopkinton, has preliminary plans for extensions and improvements in municipal power station, including installation of new oil engine-operated generating unit and accessories, switchboard and auxiliary equipment. Board of Trustees has called special meeting July 9 for final approval of project; G. G. Brown is secretary.

NEW YORK—National Division, Allied Chemical & Dye Corp., 1051 South Park Ave., Buffalo, aniline colors, dyestuffs, coal tar products, etc., has preliminary plans for expansion in local plant as a post-war project, including several new one and multi-story buildings, with machinery and electrical equipment for large increased output. Cost reported over $9,000,000. Program will be carried out over a period of months as soon as materials and equipment are available. Main offices are at 40 Rector St., New York, N. Y.

DELAWARE—Construction Service, Veterans' Administration, Washington, D. C., will have plans prepared soon for new 300-bed general surgical hospital; large tract of land has been secured. It will comprise a group of multi-story buildings, with power plant and other utility structures. Electric elevators, air-conditioning system, underground conduit lines, exterior lighting system, signal and alarm systems, and other electrical facilities will be installed. Fund of $2,000,000 has been arangde for entire project.

ILLINOIS—Commonwealth Edison Co., Chicago, has awarded general construction contract to Herlihy Mid-Continent Co., 140 South Dearborn St., Chicago, for proposed reinforced-concrete and steel addition to Calumet generating station, and work on superstructure is scheduled to begin soon. Capacity will be increased by 107,000 kw., with total project to cost approximately $11,000,000. Holabird & Root, 333 North Michigan Ave., are architects; Sargent & Lundy, 140 South Dearborn St., are consulting engineers, both Chicago.

INDIANA—Board of Public Works, City Hall, South Bend, will have plans prepared at once for electrification of municipal waterworks pumping station, converting from present steam operation, with installation of motor-driven pumping units, controls and auxiliary equipment. Proposed to ask bids soon. Consoer, Townsend & Associates, 211 West Wacker Dr., Chicago, Ill., are consulting engineers.

INDIANA—Municipal Light and Power Utilities, Fort Wayne, plans new power substation, to be known as Avondale Station, as a post-war project. Plans and estimates of cost will be prepared by municipal engineering department, City Hall.

PENNSYLVANIA—Jessop Steel Co., Washington, high-speed, carbon and alloy steels, has authorized new cold strip steel mill for post-war expansion in plant, with machinery and electrical equipment for a rated output of 6,000 tons of solid and composition alloy steels per annum. Cost reported over $1,000,000.

VIRGINIA—Water, Gas and Electric Department, Danville, has plans under way for extensions in rural electric system, totaling about 100 miles of primary and secondary lines, with service connections and other operating facilities. Proposed to begin work as soon as permission is secured.

WISCONSIN—Wisconsin Public Service Corp., Green Bay, is arranging early call for bids for proposed new 110-kv. transmission line about 35 miles. Project has a priority rating. Public Utility Engineering & Service Corp., 231 South LaSalle St., Chicago, Ill., is consulting engineer.

IOWA—Town Council, Glenwood, has called special election on July 9, to approve project for establishment of a municipal power plant, and financing in amount of $249,000 to carry out program.

INDIANA—Board of Public Works, Richmond, will receive bids until July 23 for extensions and improvements in municipal power plant, including boiler unit with rating of 100,000 lb. steam per hr., stoker and accessory equipment. W. R. Stevens is manager and engineer.

"A sure-fire way to build bigger farm loads!"

UTILITY SPONSORS LOCAL MEETINGS—Lyman Hammond, Farm Service Manager, explains Better Methods Electric Contest to East Lawn 4-H Club near Ithaca, N. Y. Also present are Club Leader Mrs. A. M. Eno, R. O. Bale, Tompkins County 4-H Club Agent, and Miss V. O. Warner, Associate County 4-H Club Agent.

4-H'ER ROGER GLEASON demonstrates his farm-built, electrically-driven egg cleaner to R. O. Bale, 4-H Club Agent. Roger is entered in the Better Methods Contest and hopes to win a *Special Award*, as well as a *Westinghouse 4-H Scholarship.*

"I SAVE A LOT OF TIME by applying Better Methods to my ironing," says Phyllis Bordenet, of East Lawn 4-H Club. Miss Frances Cantwell, Home Service Representative, coaches Phyllis in ironing by the Cornell University Method.

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This progressive utility knows that it pays to focus the attention of 4-H Club boys and girls upon *increased applications of electricity* on the farmstead.

That's why New York State Electric & Gas Corporation is supporting the Better farm-and-home Methods Electric Contest with *a 4-H program of its own* – and is augmenting the regular Westinghouse awards by offering an additional *$800 in Special Awards* to 4-H'ers who qualify in fifteen counties.

Objectives of the Better Methods Electric Contest are: to develop among 4-H boys and girls a questioning attitude toward methods and equipment used on the farm and to develop practical improvements . . . to teach them how to use electricity more effectively . . . to have them pass this knowledge on to others.

"Better Methods are synonymous with wider use of electricity" says Lyman Hammond, Farm Service Manager. *"A sure-fire way for us to build bigger farm loads – now and in the future!"*

You, too, can participate!

The Better Methods Electric Contest, sponsored by the Westinghouse Educational Foundation, is a national enterprise which is *right now* in operation in your territory. Complete information regarding the Contest, including free promotional material, is contained in the portfolio: *"Here's Help to Increase Your Farm Load."* Contact your nearest Westinghouse Office—or write for it today: Rural Electrification Section (EW-65), Westinghouse Electric Corporation, Box 1017, Pittsburgh 30, Pa.

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Recent Legislation

FLORIDA—Senate has passed a bill to require electric companies to extend rural electric lines when there is sufficient number of subscribers in a particular area to make the extension profitable.

MISSOURI—A bill to create the office of director of public transportation and public utilities, empowered to take over utilities which have ceased operation due to lockouts or strikes was introduced in the House recently by Rep. Roy Hamlin, Democrat. Under the bill the director would be "empowered to take charge of and operate at all times any public transportation company or public utility company when the same is going to or has ceased to operate because of any disagreement between employers and employees due to lockouts or strikes." The director would be appointed by the governor with consent of the Senate.

Recent Rate Changes

WEST KOOTENAY POWER & LIGHT CO. has announced a 20 percent reduction in light and power rates. The new rates apply to domestic and industrial consumers and affect all towns in West Kootenay from Nelson west. It also affects several Okanagan towns, including Princeton. The reduction will not affect the Consolidated Mining & Smelting Co.'s operations, which are under special arrangement.

SOUTHERN CANADA POWER CO., Montreal, Quebec, will put into effect as of Aug. 1, 1945, a schedule of reduced rates. The company announced that late in 1944, the company, in line with its policy of rate reductions, requested the approval of the Public Service Board for a further voluntary reduction in its rates, to take effect in 1945, and after joint collaboration, the new schedule has been agreed upon. The company statement said: "The present reduction, which affects practically every customer in the company is a very substantial one, but it is of the promotional type and it is expected that the increased use of the service which it will encourage will soon permit the company to announce still further reduction. While the domestic customers receive the greatest bulk of the reduction, particularly the customers in small and rural communities, the commercial customers and the small power customers get a very welcome cut in rates."

EASLEY, S. C., water and light plant customers will receive a cut in electric rates, the Commission of Public Works having set up a new schedule. Geared to affect all users of electricity and simplified by combining the classes of users, the reduction for residential consumers was made on the first 100 kw-hr., so as to benefit both large and small customers. The reduction is from $3.25 to $3.00 for the first 100 kw.-hr. on the residential rate, which ranges from four cents down to one and one-fourth cents per kilowatt-hour with monthly minimum charge of 75 cents. For the business houses and large power consumers the old commercial lighting rate and old power rate were combined into a rate to be known as commercial lighting and power. In the combination, a sizable reduction resulted for commercial users. There is only one rate in the new schedule for rural customers, a combination of former rural residential rates. There is a special rate for water heating.

PAYROLL SAVINGS PLAN

NOW'S THE TIME FOR *Your* BIG "MOP-UP"!

RE-SOLICITATION is the keynote for a victorious "mop up" in the Mighty 7th War Loan. Bond rallies plus continuous competition between departments help to keep Bond subscriptions on a quota-topping climb. Strategic poster displays . . . showings of "Mr. & Mrs. America," the Treasury film . . . distribution of the War Finance Booklet, "How To Get There," and the handy Bond-holding envelopes play an important part. But, above all else, arrange to have every employee asked *once more*—and personally urged *once more*—to meet his personal quota in the Mighty 7th!

The Payroll Savings Plan is the mainstay of every War Loan—meeting your plant quota is vital to the success of the 7th! Remember we have to make two drives in 1945 do the work of three last year. Put on an intensive "mop up" final to help mop up the Japs, cut the tentacles of inflation—and lay the foundation of security.

The Treasury Department acknowledges with appreciation the publication of this message by

ELECTRICAL WORLD

★ *This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council* ★

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... just as it has helped thousands of other busy electrical men. E-B-R is the *only* annual reference published in, and for, the electrical industry. It is designed with *your* procurement problems on mind—designed to make your work easier, and to save you time and money.

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and LOUIS EDWIN MARKLE
Design Engineer

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This book brings you up to date on the latest control apparatus—new uses of the electron tube, magnetic contactors, time-limit method of acceleration, development of plugging control, and of the Regulex, Ampledyne and Rotorol, and new types of time-delay overload relays. Here is analysis of popular commercial types, and most successful methods of accelerating motors, speed control, mechanical and dynamic braking, regeneration, and voltage control for d-c motors, with special sections on protective devices, national codes, installation and maintenance, and future control developments.

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REA Funds Allotted; Contracts Approved

Loans to 70 cooperatives in 23 states, totaling $8,033,000, have recently been approved by the Rural Electrification Administration. Most of the allotments, which are made against the loan authorization for the fiscal year 1946 against which advances cannot be made until after June 30, will be used for extension of electrical service.

Allotments are as follows:

ARKANSAS—Clay County Electric Cooperative Corp., Corning, $135,000; Carroll Electric Cooperative Corp., Berryville, $50,000.

FLORIDA—Glades Electric Cooperative, Inc., Moore Haven, $215,700 for line construction and $259,300 for generating facilities; Gulf Coast Electric Cooperative, Inc., Panama City, $100,000; Choctawhatchee Electric Cooperative, Inc., DeFuniak Springs, $50,000.

GEORGIA—Tri-County Electric Membership Corp., Gray, $50,000.

ILLINOIS—Southern Illinois Electric Cooperative, Dongola, $75,000 including fund for substation construction; Clinton County Electric Cooperative, Inc., Breese, $45,000.

INDIANA—Daviess-Martin County REMC, Washington, $50,000.

IOWA—Guthrie County Rural Electric Cooperative Assn., Guthrie Center, $125,000; Southern Iowa Electric Cooperative, Inc., Bloomfield, $100,000; Buchanan County Rural Electric Cooperative, Independence, $75,000; D.E.K. Rural Electric Cooperative, Estherville, $75,000; Lyon Rural Electric Cooperative, Rock Rapids, $75,000; Pella Cooperative Electric Assn., Pella, $60,000; Cherokee County Rural Electric Cooperative, Cherokee, $50,000; Sac County Rural Electric Cooperative, Sac City, $50,000; Woodbury County Rural Electric Cooperative Assn., Moville, $50,000; Hancock County Rural Electric Cooperative, Garner, $45,000.

KENTUCKY—Henderson-Union Rural Electric Cooperative Corp., Henderson, $60,000; Blue Grass Electric Cooperative Corp., Nicholasville, $50,000; Clark Rural Electric Cooperative Corp., Winchester, $50,000; Jackson County Rural Electric Cooperative Corp., McKee, $50,000; Licking Valley Rural Electric Cooperative Corp., West Liberty, $50,000; Owen County Rural Electric Cooperative Corp., Owenton, $50,000; Salt River Rural Electric Cooperative Corp., Bardstown, $50,000; Shelby Rural Electric Cooperative Corp., Shelbyville, $50,000; South Kentucky Rural Electric Cooperative Corp., Somerset, $50,000; Taylor County Rural Electric Cooperative Corp., Campbellsville, $50,000.

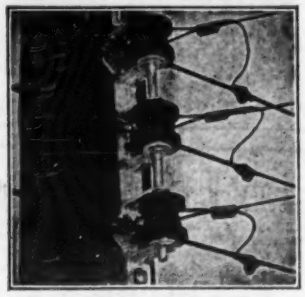
LOUISIANA—Beauregard Electric Cooperative, Inc., DeRidder, $40,000.

MICHIGAN—Cherryland Rural Electric Cooperative Assn., Traverse City, $95,000.

MINNESOTA—People's Cooperative Power Assn. of Olmsted County, Rochester, $154,000.

MISSISSIPPI—Southwest Mississippi Electric Power Assn., Lorman, $50,000.

MISSOURI—Ozark Electric Cooperative, Mt. Vernon, $150,000; Sac-Osage Electric Cooperative, Inc., El Dorado Springs, $150,000; Pemiscot-Dunklin Electric Cooperative, Hayti, $140,000; Southwest Electric Cooperative, Bolivar, $130,000; White River Valley Electric Cooperative, Inc., Hollister,



Matthews Wire Clips

Many power companies are using Matthews Wire Clips for holding service drop wires. They save time and waste of twisting wires. Make neater job.

The patented locking tongue is inserted between the wire forming the loop and the clip is clamped tight over the insulation with a pair of pliers or wire connectors, as illustrated.

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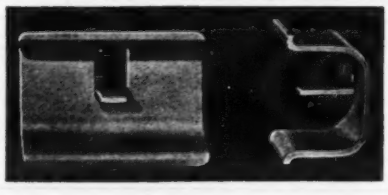

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Expert advice on location and purchase of right of way.
Industrial plant layouts & surveys. Rate comparisons.
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Electric, Steam and Hydraulic Projects. Investigations, Reports, Designs and Appraisals.

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ENGINEERS — CONSULTANTS
Power Plants — Industrial Plants
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$120,000; Intercounty Electric Cooperative Assn., Licking, $50,000.

MONTANA—Missoula Electric Cooperative, Inc., Missoula, $50,000.

NEBRASKA—Midwest Electric Membership Corp., Grant, $400,000; Cedar-Knox County Rural Public Power District, Hartington, $50,000; Stanton County Rural Public Power District, Stanton, $40,000.

NORTH CAROLINA—Surry-Yadkin Electric Membership Corp., Dobson, $327,000; Wake Electric Membership Corp., Wake Forest, $25,000; Haywood Electric Membership Corp., Waynesville, $25,000.

OHIO—Washington Electric Cooperative, Inc., Marietta, $396,000; Guernsey-Muskingum Electric Cooperative, Inc., New Concord, $375,000; Adams Rural Electric Cooperative, Inc., West Union, $60,000.

OKLAHOMA—Central Rural Electric Cooperative, Stillwater, $170,000; People's Electric Cooperative, Ada, $140,000; Alfalfa Electric Cooperative, Inc., Cherokee, $125,000; Cotton Electric Cooperative, Walters, $120,000; Oklahoma Electric Cooperative, Norman, $50,000.

OREGON—Wasco Electric Cooperative, Inc., The Dalles, $692,000.

PENNSYLVANIA—Central Electric Cooperative, Inc., Parkers Landing, $124,000.

TEXAS—Bailey County Electric Cooperative Assn., Muleshoe, $150,000; Dickens County Electric Cooperative, Inc., Spur, $100,000; Jackson Electric Cooperative, Inc., LaWard, $100,000; Kimble Electric Cooperative, Inc., Junction, $100,000; North Plains Electric Cooperative, Inc., Perryton, $100,000; Stamford Electric Cooperative, Inc., Stamford, $100,000; Victoria County Electric Cooperative Co., Victoria, $100,000.

VERMONT—Halifax Electric Cooperative, Inc., Brattleboro, $50,000.

VIRGINIA—BARC Electric Cooperative, Millboro, $50,000; Central Virginia Electric Cooperative, Lovingston, $50,000.

WISCONSIN—Dairyland Power Cooperative, Genoa, $500,000 for construction of generating facilities; Waupaca Electric Cooperative, Inc., Iola, $60,000; Marathon-Portage Electric Cooperative, Inc., Hatley, $45,000; Adams-Marquette Electric Cooperative, Friendship, $35,000.

Construction Contracts Approved

ARKANSAS—Woodruff Electric Cooperative Corp., Augusta, contract to Harvill-Byrd Electric Co., Little Rock, Ark., 17 miles of line; labor only, $13,711.

FLORIDA—Suwanee Valley Electric Cooperative, Inc., Live Oak, contract to Burnup & Sims, West Palm Beach, Fla., 75 miles of line; labor only, $24,117; engineer, Ladd Engineering Co., Moultrie, Ga.

IDAHO—Northern Idaho Rural Electrical Rehabilitation Assn., Inc., Sandpoint, contract to L. J. Peterson, Sandpoint, Idaho, 25 miles of line; labor and materials, $26,772; engineer, H. A. Sewell, Newport, Wash.

NORTH CAROLINA—Surry-Yadkin Electric Membership Corp., Dobson, contract to Rockingham Construction Co., Harrisonburg, Va., 17.4 miles of line; labor only, $6,622.

SOUTH CAROLINA—Lynches River Electric Cooperative, Inc., Pageland, contract to E. C. Bridges, Heath Springs, S. C., 15 miles of line; labor only, $4,977; engineer, J. B. McCrary Engineering Corp., Atlanta, Ga.

VIRGINIA—Powell Valley Electric Cooperative, Jonesville, contract to Smith Construction Co., Nashville, Tenn., 50 miles of line; labor only, $21,069.

SEARCHLIGHT SECTION

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BUSINESS : :USE OR RESALE

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Positions Wanted (full or part time salaried employment only) ½ the above rates payable in advance.
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PRODUCTION ENGINEER — fractional h.p. electric motors. Should have specialty background in single phase motors, having devoted major effort to efficient mass production. Line will have limited size range. Engineering design experience desirable for development of motors for tooling and production. Permanent connection with outstanding Southern California manufacturer entering household appliance field. Send details of experience and personal qualifications to A. W. A., Box 68, Station K, Los Angeles, California.

MECHANICAL ENGINEER familiar with steam power plant work for permanent position with midwest engineering firm as assistant to head of mechanical engineering section. Good opportunity. Give complete experience record and statement of availability. P-883, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL DRAFTSMAN, experienced in overhead distribution and substation design; also meter and relay technician, thoroughly competent to repair all types of protective relays, watthour and demand meters and laboratory equipment. Location, Northern Alabama. In reply state experience, age, references, salary desired and when available. P-905, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ASSISTANT SUPERINTENDENT overhead lines, practical lineman, age 27 to 32 years. Permanent position with electrical contractors in construction of power and REA electric transmission lines in Central Ohio. P-906, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: ELECTRICAL Engineer, designer engineer, teacher. Can place permanently in our organization one or two alert aggressive electrical engineers, preferably with considerable background in electronics and electrical apparatus design, some teaching experience would be highly desirable. Good starting salary, bonus, and unlimited possibility for advancement to party of suitable qualifications. P-907, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED ELECTRICAL Engineers — sales engineer, products engineer, development and research engineer. Permanent position with established Mid-Western manufacturers with excellent post-war prospects. Attractive salary, pleasant living conditions. Unusual opportunity for advancement. Write at once, giving experience and salary expected. All replies held confidential. P-908, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 35 years recognized standing negotiates for high salaried supervisory technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission's. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

PROTECTIVE RELAY and starting engineer. Twenty years with top Eastern Utility. West coast or New England preferred. PW-897, Electrical World, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 196)

WANTED

POWER ENGINEER

To take charge of the operation of industrial power house and related services such as air conditioning and water filtration for large manufacturing plant located in Western North Carolina. Applicants please state age, education, previous experience and salary desired; photograph or snapshot not returnable.

P-900, Electrical World
330 West 42nd St., New York 18, N.Y.

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Manager for our Machinery and Equipment Department Experienced with machinery and equipment used in heavy industries —like cranes, ground and overhead; steel buildings and structures, power plants, mining, contractors, etc. Drawing account and participation. Unusual opportunity for good high grade man. Confidences respected.

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40 years' experience
13438 S. Brainard Avenue, Chicago 33, Ill.
"ANYTHING containing IRON or STEEL"

ELECTRICAL ENGINEER

A Western New York manufacturer of heavy machine tools desires the services of an electrical engineer or experienced draftsman willing to break in on electrical designing.

The work will consist of designing control panels, switchboards and electrical systems of large machine tools.

This opening is permanent to the right man and offers excellent post-war prospects with well established, nationally recognized tool manufacturer.

Apply by letter, stating age, experience, education and other pertinent data. W.M.C. rules apply.

P-880, Electrical World
330 West 42nd St., New York 18, N. Y.

Resident Engineers and staking party chiefs experienced in rural line construction. Permanent work with civil and electrical engineering firm.

Location Ohio and surrounding States.
Give full information and availability.
RALPH L. WOOLPERT COMPANY
132 North Main St. Dayton 2, Ohio

(Additional Employment Ads on page 196)

POSITIONS WANTED

Continued from page 195)

ACCOUNTANT OR Executive. Have had fifteen years experience in electric and gas utility in general and commercial accounting, property records, customers service etc. Have had supervision and organization work. Available immediately. PW-898, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SALESMAN WANTED

SALES ENGINEER — Available for postwar position for Boston or N. E. area. Young, aggressive, electronics production engineer with thorough knowledge of machine shop practice. Prewar motor sales and office management experience. Graduate EE. SW-909, Electrical World, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVES AVAILABLE

WANTED CONTACT with manufacturers of electrical industrial equipment desirous of representation in New England. Write RA-910, Electrical World, 330 W. 42nd St., New York 18, N. Y.

MANUFACTURER'S AGENT interested in several select lines for intensive coverage of Washington, Oregon, Montana and Idaho. 15 years electrical engineering and sales experience. Thorough knowledge of industrial and electronics equipment—want equipment lines. Write Manufacturer's Sales Terminal, 222 Columbia Building, Spokane 8, Washington.

ESTABLISHED REPRESENTATION offered for sale of production products to manufacturers in New York, Philadelphia, Washington area and to export trade. Please advise products, commission arrangements and coverage desired. RA-911, Electrical World, 330 W. 42nd St., New York 18, N. Y.

WANTED

SALES EXECUTIVES AND SALESMEN

for

INDUSTRIAL, COMMERCIAL AND RESIDENTIAL DIVISIONS

An excellent opportunity to join one of the larger light and power companies with a successful past and a good future.

Age limit 25 to 40. In first letter please give complete information about training, experience, salary expected, and how soon available.

All replies held in confidence. Our salesmen know about this advertisement.

SW-912, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Construction Engineers

Old, established consulting engineering and construction organization in New York City has good opportunities for construction engineers experienced in public utility and industrial construction work. Must be thoroughly qualified to direct field layout work, inspection work, preparation of construction reports and specifications for subcontracts; and to interpret plans and specifications. Reply must give full particulars as to age, education, experience record, availability, salary desired, etc. Please attach photograph.

P-875, Electrical World
330 West 42nd St., New York 18, N. Y.

FIRE PREVENTION ENGINEER

wanted by large Eastern corporation. Graduate engineer, experienced in fire insurance inspections for prevention and rating; home office experience also desirable; age 30 to 40. State age, education, prior business connections, salary expected, and other qualifications.

P-903, Electrical World
330 West 42nd St., New York 18, N. Y.

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Experienced in
DESIGN of POWER & INDUSTRIAL PLANTS
Location N. Y. City

EBASCO SERVICES INC.
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Electrical Distribution Engineers

wanted by central office of 30 rural distribution cooperatives. Preference given to ex-servicemen. Positions permanent. WMC rules apply. Write

WISCONSIN ELECTRIC COOPERATIVE
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Agencies wanted by well established firm in close contact with all Public Electric Utilities in Australia for all classes of Overhead Line Material especially Lightning Arrestors, House Service Meters, Time Switches, etc. Reply:—

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Experienced electrical engineer to direct electric motor sales for a national company. Replies will be treated strictly confidential.

SW-902, Electrical World
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Cash Ready

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Electric motors, AC and DC.
Compensators
Generators
Motor Generator Sets
Air and Oil Circuit Breakers
Panels
Exhaust Fans
Control Equipment

Send us list with full details
WIRE OR PHONE

POWER EQUIPMENT CO.
154 ANDREWS ST., ROCHESTER 4, N. Y.
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A.C. Wanted to Buy D.C. WATTHOUR METERS

Any quantity

Please state particulars

ATLANTIC ELECTRIC METER CO.
214 East 41st Street
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TO HELP YOU...

find equipment you need

"Searchlight" Advertising

WANTED

SALES ENGINEERS

Excellent opportunities await young men who can qualify as sales engineers for a progressive middlewestern manufacturer of power line equipment. Must be men with engineering degree or practical engineering experience with a definite sales personality who believe there is a greater future in selling than their present opportunities afford. Write in detail giving full information about yourself and past experiences to

SW-904, Electrical World
520 North Michigan Ave., Chicago 11, Ill.

WANTED

D. C. METERS—Type C6
A. C. METERS—60 Cycle

Send us a list of the D.C. and A.C. meters you wish to dispose of. We purchase large and small quantities.

The Electric Meter Corporation
Incorporated 1915
1776 Broadway, New York 19, N. Y.

WANTED

To Purchase Electric Utility in small community under 2000 population. Either steam, Diesel or High Line source.

Address: P. O. Box #207
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1
Non-condensing
TURBINE

No. 469, 150# steam 5 lb. back pressure, 1000 KW, Generator No. 102961, 15.05 Amp., 3600 R.P.M., 80% P.F., 480 volts, 3 phase, 60 cycle, water rate ½ load 41.4#, ¾ load 37#, full load 34.75# per KW Hr. Purchased May 21, 1913. This unit is now in operation and is in excellent condition, having been recently completely reconditioned.

CLINTON COMPANY
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Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries, Transformers, Motors, Compressors, Induction Voltage Regulators, Oil Circuit Breakers, etc.

Service backed by 40 years' experience

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FOR SALE

Hertner Transverter No. 5355; Type D-1-50-50; RPM 1750; Amps 50; Volts 55/110. Also Wagner Converter Type 14TBC; 1800 RPM; 3 Phase; 60 Cycle; 45 Volts; 75 Amps; Direct Current Cont. Rating 50°C; 75 Volts; 75 Amps; 5.63 K.W. Serial #317224. Make offer to

RUSSELL THEATRE
5337 Russell, Detroit.

FOR SALE

1—3 kw D.C. 110-220 volt, motor generator set, driven by 110-220 a-c motor, s-eed 1750, cycle 60. Condition practically new. Price $450.

FS-901, Electrical World
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New "SEARCHLIGHT" Advertisements

received by June 28th appear in the July 7th issue, subject to space limitations.

Address copy to the Departmental Staff

ELECTRICAL WORLD
330 West 42nd St., New York 18, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1602 53rd ST NORTH BERGEN N J N Y C Tel LOngacre 5 3227 N J Tel UNion 3-2000

MOTORS
3 PHASE 60 CYCLE

1—500 HP, 900 RPM, 440 volt, Lincoln slip ring
1—350 HP, 300 RPM, 440 volt, G.E. slip ring
1—225 HP, 1800 RPM, 220 volt, G.E. slip ring
1—200 HP, 600 RPM, 440 volt, Crocker Wheeler slip ring
1—200 HP, 600 RPM, 2200 volt G.E., sl. rg.
1—200 HP, 450 RPM, 2200/4000 v. G.E. sl. rg.
1—150 HP, 1800 RPM, 440 volts, G.E. sq. cg.
2—150 HP, 1200 RPM, Westinghouse, squirrel cage
2—150 HP, 1800 RPM, 220 volt, Westinghouse slip ring
1—100 H.P. 1800 R.P.M. 440 volt, General Electric, squirrel cage
1—60 H.P. 1200 R.P.M. 2200 volt, General Electric, slip-ring

D. C. 230 VOLTS

2—450 HP, 440 RPM, General Electric MPL.
1—250 HP, 760 RPM, Electro Dynamic.
1—150 HP, 750 RPM, Electro Dynamic.
1—150 HP, 500 RPM, General Electric, MPC.
1—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, 625 RPM, G.E.
1— 80 HP, Crocker-Wheeler, 600 RPM.
1— 75 HP, 575 RPM, General Electric
3— 50 HP, 700 RPM, Crocker-Wheeler

VARIABLE SPEED 230 VOLTS

1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electric Dynamic.
1—60 HP, 500/1000 RPM, Diehl.
1—30 HP, 225/900 RPM, Crocker-Wheeler.
1—30 HP, 400/1200 RPM, General Electric.
2—25 HP, 650/2200 RPM, Westinghouse.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—15 HP, 300/1200 RPM, General Electric.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1—10—HP, 400/1600 RPM, Westinghouse, SK.
1— 5 HP, 450/1800 RPM, Crocker-Wheeler.

MOTOR GENERATOR SETS

1—75 KW, 125 volt, General-Electric, squirrel cage.
1—15 KW, 250 volt, G.E. squirrel cage.

TRANSFORMERS

2—400 KVA, G.E. 4156-240/480 v. Scott taps.
3—300 KVA, Pittsburgh 7800/440 volt.
3—150 KVA, G.E., 33,000 2300/4000 Y.
3—100 KVA, Westinghouse, 11,430/250 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
2—100 KVA, G.E. 2200/220/440.
2— 75 KVA, General Electric 3 phase, 4150 Y, 120/208Y.
3— 50 KVA, Pittsburgh 2300/220/110.

ALTERNATORS

1—625 KVA, 3600 RPM, 600 volt, G.E.
1—225 KVA, 514 RPM, 600 volt, Westinghouse.
1—200 KVA, 3600 RPM, 250 volt, Allis-Chalmers.
1—62½ KVA, 3600 RPM, 220 volt, Allis-Chalmers.

TURBO GENERATORS

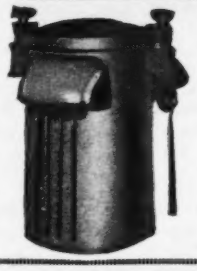
600 KW, Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder.
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1— 30 KW, 125 volt, Allis Chalmers.

ENGINE GENERATOR SETS

1—150 KVA, General Electric Generator, Ames Uniflow engine.
1—62½ KVA, Westinghouse Generator, Fairbanks company engine.

Complete Line of A.C. and D.C. Motors and Generators

TRANSFORMERS



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We have several thousand transformers in stock for prompt shipment, and invite your inquiries.

PIONEER TRANSFORMER REBUILDERS
We rewind, repair and redesign all makes and sizes.
One Year Guarantee

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
STATION M Since 1912 CINCINNATI 27, OHIO

Rotary Converters—3 Ph. 60 Cy.

K.W.	Make	R.P.M.	D.C. Volts	A.C. Volts
1—1500	Whse.	720	650	11500
1—1250	G.E.	720	250	2300
1—1000	Whse.	900	600	2300
2— 750	Whse	1200	600	2300/4000
1— 500	G.E.	1200	600	13200/2300
1— 300	Al. Ch.	1200	250	2400

Rotary Converters—3 Ph. 25 Cy.

2—1500	G.E.	500	225/275	6600
1— 500	G.E.	750	225/275	6600

M. G. Sets—3 Ph. 60 Cy.

1—1500	G.E.	360	250	2300/4600
1—1000	G.E.	720	250	2300/4150
1— 500	G.E.	720	600	13200
1— 400	G.E.	720	250	2300
1— 200	G.E.	720	125	440

BELYEA COMPANY, INC.
51 Howell Street, Jersey City, N. J.

DIESELS

ROBERT SCHOONMAKER
Port Washington, Long Island, N.Y.
Phone Roslyn 1220

NEW INSULATED MAGNET WIRE

Size	Description	Approx. Weight
.072" (#13 Awg)	Triple Cotton Cov., Round	306#
.072" (#13 Awg)	Asbestos Ins., Reels	134#
.081" (#12 Awg)	Single Glass Cov., Round	2,000#
.081" (#12 Awg)	Single Glass Cov., Round	685#
.129"	Asbestos Ins., Varnish, Round	495#
.049"x.437"	Double Cotton Cov., Rect.	647#
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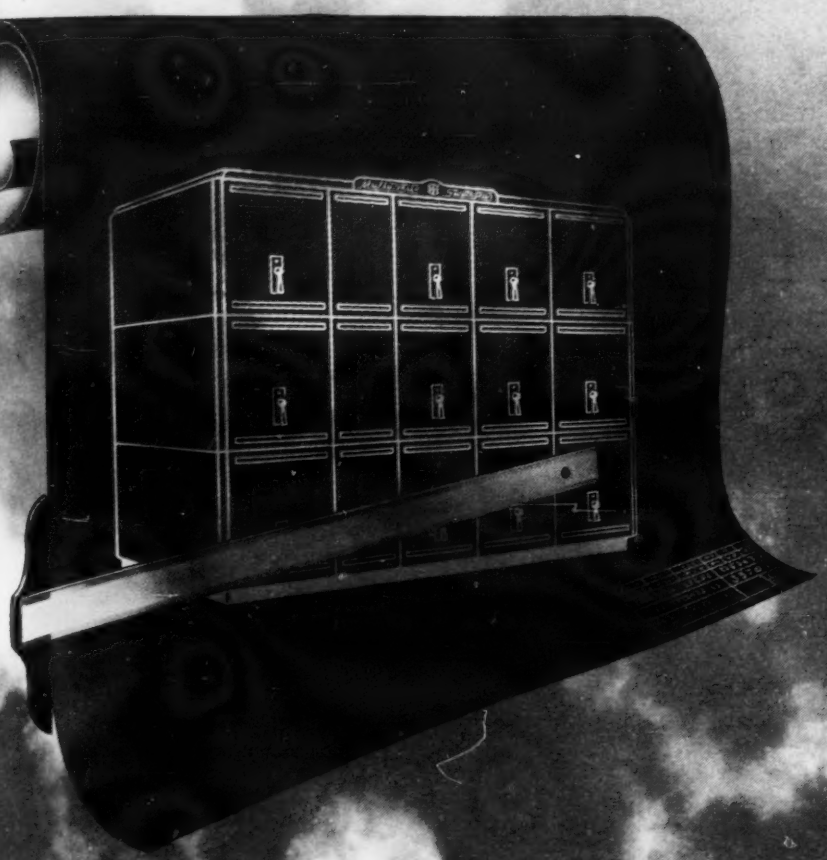

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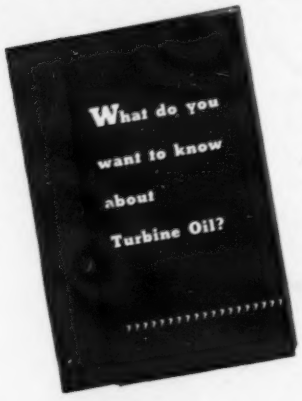

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